APPENDIX D

ENVIRONMENTAL RESTORATION

1.0 INTRODUCTION

Past Rocky Flats operations generated nonhazardous, hazardous, radioactive and radioactive mixed waste streams. For over 40 years, common practices such as onsite waste storage and disposal, and incidental spills and releases led to contamination of soils, buildings, and groundwater at the Site. Due to this contamination, Rocky Flats was placed on the National Priorities List (NPL) for cleanup in 1989 and 178 Individual Hazardous Substance Sites (IHSSs) were identified in 1991. These IHSSs are defined as individual locations where solid wastes, hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents may have been disposed or released to the environment irrespective of whether the unit was intended for the management of these materials).

1.1 Scope and Purpose

The purpose of this Appendix is to evaluate a range of potential alternatives that would achieve final closure of the Site. These alternatives include closure of existing landfills and the IHSSs, and they also address groundwater contamination and surface-water management. Environmental Restoration (ER) closely integrates activities with other components of the ASAP, such as facility decommissioning, waste management, and special nuclear materials consolidation and storage.

1.2 ASAP Phase I Update

Phase I of ASAP evaluated one possible alternative for closure of Rocky Flats in order to radically decrease Site risks and increase land availability for potential other uses. The lessons learned from the first phase include:

- The pond systems could be converted to wetlands after remedial activities are complete.
- A more extensive final cover is required for the Protected Area to prevent infiltration, and burrowing by animals.

1.3 Task Description

Phase II of ASAP looks at a variety of alternatives as discussed in the main text. The four major alternatives which affect ER are listed below:

- Alternative 1, Unrestricted – This alternative describes the cleanup of the entire Site to 10^{-6} residential standards. All remediation waste would be disposed offsite and a groundwater management system would be in place until groundwater is remediated to residential standards.
- Alternative 2, BEMR I – This alternative represents early site planning that was published by DOE in the Baseline Environmental Management Report (BEMR) of March 1995, a Congressionally mandated report. The buffer zone would be remediated to 10^{-5} open space and recreational standards and the Industrial Area remediated to 10^{-4} industrial standards. Groundwater management systems are maintained until 2040.

- Alternatives 3, Retrievable, Monitored Storage & Disposal – This alternative evaluates remediation of IHSSs and groundwater to negotiated standards, capping a large portion of the Industrial Area and disposing of most low-level and low-level mixed waste onsite in RCRA Subtitle C-type landfill(s). For environmental restoration, Alternatives 3a, 3b, 3c, 3d, and 3e were evaluated and found to be basically the same and are therefore referred to simply as Alternative 3 in this appendix.

- Alternative 4, Mothball – This alternative evaluates the cleanup of the Site to necessary and sufficient safety levels. A groundwater management system would be in place indefinitely. Facilities remain standing but vacant unless it makes economic sense to demolish them. This alternative also includes some onsite waste disposal.

Six subtasks necessary to achieve closure were defined as follows:

1. IHSSs: In the Interagency Agreement of January 1991 between DOE, EPA, and CDPHE, 178 IHSSs were identified. Since that time, 15 have been removed from the list because of low risk or other reasons. In addition, 4 IHSSs were split into two locations. Therefore, a total of 167 IHSSs are currently being evaluated. In addition, Potential Areas of Concern (PAC) and areas of Underground Building Contamination (UBC) also must be addressed. This subtask involves the remediation of these areas.

   To support closure around an ASAP configuration, a screening method to prioritize the IHSSs for potential actions was developed and implemented (Final Implementation Plan for the FY95 Performance Measure: Environmental Risk Prioritization, RMRS, August 4, 1995). This method results in a risk prioritization score based on comparison of contaminant levels to risk-based preliminary remediation goals (PRGs), evaluation of mobility of contaminants, potential for future release, and use of professional judgment to interpret the first three components. As additional data are collected, a few of the locations may change ranking. The State and EPA have tentatively accepted the ranking.

   Based on this prioritization, the areas in all the alternatives have been divided into high and low categories. These are defined as the following:

   High - A location that will be remediated
   Low - A location that will not be remediated.

   The criteria for whether a location is high or low varies for each alternative based on risk. For example, IHSS 100 is in the high category for Alternatives 1-4 although the volume changes because of the different criteria. However, IHSS 101 is in the high category for Alternative 1 and in the low category for Alternatives 3 and 4.

2. Existing Landfills: This subtask addresses those IHSSs that are existing landfills. They include Operable Unit (OU) 7 (IHSS 114 and the landfill pond) and OU 5 (IHSS 115).

3. Contaminated Groundwater: This subtask addresses the management of contaminated groundwater at the Site which was the result of historical waste disposal practices, spills, and leaks at several locations. These source areas are designated as IHSSs. Groundwater generally flows from west to east on the Site and is contaminated primarily with volatile organic compounds (VOCs). These compounds are typically more mobile than other contaminants and are detected in groundwater at concentrations significantly above action levels for the various alternatives at the Site. Metals and radionuclides are not addressed in this discussion, since analyses of these compounds indicate that in general, the concentrations in Site groundwater are low or are not significantly migrating.

Conceptual groundwater remediation approaches and order-of-magnitude cost estimates were developed for the alternatives. A detailed engineering analysis, including detailed cost estimates, must be prepared before choosing a recommended system for any of the alternatives. The sitewide groundwater strategy will be used to provide detail for this approach.

4. Surface Water: This subtask involves management of surface water flowing through and off the Site. Surface water is currently allowed to collect in the pond system, is sampled, and then released in a batch style. This system is effective, but difficulty is encountered when large storm events occur and the retention system is already at or near capacity. Therefore, as part of the overall Environmental Restoration strategy, a flow-through system is being proposed for surface water management.

5. Final Cover: This subtask addresses the final cover for Alternative 3 (i.e., a cap) that will be placed over a portion of the Industrial Area after remedial activities, waste storage/disposal and decommissioning have been accomplished.

6. Overall Environmental Monitoring: This subtask addresses the environmental monitoring (air, surface water, ecological, and groundwater) that will be conducted during the building decommissioning and environmental restoration activities. In addition it discusses the monitoring that will be conducted after interim closure of the Site has been achieved.

2.0 TASK INTERDEPENDENCIES

For all the alternatives except Alternative 1, Unrestricted, retrievable waste interim-storage facilities must be in place before significant quantities of low-level wastes and low-level mixed wastes are excavated and major decontamination and decommissioning (D&D) begins. In Alternatives 1 and 3, D&D activities must be completed prior to remediation of UBC.

3.0 GENERAL ASSUMPTIONS

General assumptions for all alternatives include the following:

- IHSS, PAC, and UBC waste volume estimates are based on current data and could change significantly when additional data are collected. Currently there are limited analytical data for many of the IHSSs, PACs, and UBCs (particularly in the Industrial Area). Waste volumes will be adjusted appropriately as additional data are collected.

- The IHSS category is based on the Environmental Prioritization, available data, and best engineering judgment. As additional data are collected, the IHSS categories could change.

- For the purpose of this evaluation, it was assumed that all contaminated soils in IHSSs, PACs, and UBCs would be excavated, thermally treated, and disposed. However, each IHSS would be evaluated on a case-by-case basis and the appropriate remedial action would be implemented. In some cases, this would be excavation and thermal desorption. In other cases, in situ treatment, containment, or another type of remedial action might be more appropriate.

- All disposal costs and treatment to satisfy LDR requirements, if required, would be covered under waste management. Environmental restoration includes excavation of the waste and thermal desorption if necessary.

- The outer buffer zone (excluding the surficial soil low-level plutonium contamination area) is assumed to meet open-space criteria without additional remediation based on the historical use of the area and available data.

- All significant groundwater contamination plumes have been identified.

- The proposed groundwater treatment technology (i.e., reactive barriers) is applicable for the Site without any bench or pilot scale testing. Further investigation of this technology with respect to actual Site conditions (e.g., geology, hydrology, contaminants) is required. As information is collected, the feasibility of the technology will be verified.

- As an average, $20,000 will be used for No Action/No Further Action documentation.

- Removal of contaminant sources in all alternatives would be effective in limiting contaminant load to groundwater and would allow for effective use of the reactive barriers or other treatment technology if required for groundwater treatment.

- The majority of the groundwater in the industrial area is due to the Site infrastructure. As Site infrastructure decreases, the groundwater level will decrease. Modeling will need to be conducted to determine the impact to the groundwater management system, surface water, and wetlands.

- The Woman Creek Project will protect downstream water users in the event of a 100-year storm event or upstream dam failure (i.e., Dam C-2).

- The Broomfield Water Supply Project will be in place and the risk pathway to public water supplies will be minimized.

4.0 ALTERNATIVE OPTIONS

For the purpose of this analysis, three of the four main Alternatives were analyzed (as previously described) from the ER perspective and are discussed in this section:

- Unrestricted (1)
- BEMR I (2) (not analyzed)
- Retrievable, Monitored Storage and Disposal (3)
- Mothball (4)

4.1 Alternative 1, Unrestricted

4.1.1 Description

The following is a description of environmental restoration components as they would occur under Alternative 1, Unrestricted. The presumed land use under this alternative (see Figure D-1 at the back of this Appendix) would be approximately 6200 acres of unrestricted open space. In this alternative, all locations would be remediated to 10^{-6} residential standards, there would be no cap, and all waste would be shipped offsite.

Approximately 115 IHSSs have currently been identified for remediation under this alternative. The remaining IHSSs will not require remediation since they are below the 10^{-6} risk level. The groundwater at the Site would be managed to meet residential standards at a point of compliance by using a series of funnel and gate systems to collect and treat contaminated groundwater, and upgradient diversions to divert uncontaminated groundwater from flowing through contaminated areas. The surface-water ponds would initially be converted to a flow-through system and then converted to wetlands after the completion of remedial activities. The pond system could be converted to wetlands because all potential sources of surface contamination would be removed. The existing landfills would be excavated and disposed offsite.

In addition, this alternative would include excavating and disposing 2,125,000 m^3 of material offsite with approximately 670,000 m^3 of this excavated material treated prior to offsite disposal. Institutional controls would not be needed because the Site would be remediated to cleanup levels which are based on residential standards.

4.1.2 Subtasks

Alternative 1 has been divided into five specific subtasks and includes IHSSs, Landfills, Contaminated Groundwater, Surface Water, and Overall Environmental Monitoring. The following sections provide detail for each subtask and describe how the individual components contribute to achieving Alternative 1, Unrestricted.

IHSSs

The description of the two categories of IHSSs, PACs and UBCs is as follows:

- High Ranked IHSSs: Under this Alternative, the criteria for high category IHSSs, PACs, and UBCs are those locations with an associated risk exceeding the 10^{-6} excess cancer risk for the residential exposure scenario and thus require remediation. There are 115 IHSSs that have been ranked high. Table D-1 (all tables are found at the end of this Appendix) presents the high-ranked IHSSs and the volume of waste and treatment technology associated with each IHSS. The IHSSs categorized as high are listed by numerical order. The IHSSs will be sequenced in the future based on risk, accessibility, and funding. In addition, these IHSSs are shown graphically in Figure D-2. Since the PACs and UBCs have not been adequately characterized, it was assumed that 40 percent of their total volume would require remediation.

  This Alternative includes excavation of these high-ranked IHSSs followed by low-temperature thermal desorption treatment if necessary and final disposal in an offsite facility. The final disposition of this waste is discussed in more detail in Appendix B, Waste Management. A total of 895,000 m^3 would be excavated and it was assumed that 75 percent of this waste would be thermally desorped (670,000 m^3).

  In addition, due to the low cleanup levels that would be required under this alternative, there is an area of approximately 680 acres with plutonium concentrations that exceed the residential 10^{-6} exposure scenario in the outer and inner buffer zone. It was assumed for this alternative that this area would be excavated and disposed offsite. The volume of waste is estimated to be 850,000 m^3.

- Low Ranked IHSSs: Under this alternative, the criteria for low category IHSSs, PACs, and UBCs are those locations where the associated risk does not exceed a 10^{-6} excess cancer risk for residential exposure. There are 52 IHSSs that have been ranked low. Table D-1 presents the low-ranked IHSSs.

  The low-ranked sites will undergo the No Action/No Further Action (NA/NFA) Decision Criteria. No Action or No Further Action can be justified for a site if one of the following criteria is met:

  — If a previous removal action has removed a contaminant source from an IHSS

— If a contaminant source has been removed from an IHSS through natural attenuation processes

— If historical release information and data indicate that no release occurred

— If detailed evaluation of data from the IHSS indicates that there is acceptable risk

If NA/NFA is not justified, then appropriate remedial actions or risk management will be implemented.

Existing Landfills

Since the objective of Alternative 1 is to create an area where no contamination exists, both of the landfills will be excavated and disposed offsite. The disposal of this waste is discussed in Appendix B, Waste Management. Approximately 310,000 m^3 would be excavated from the OU 7 landfill and 70,000 m^3 from OU 5 landfill.

Contaminated Groundwater

Historical waste disposal practices, spills, and leaks have resulted in five major plumes of groundwater contaminated with VOCs. The plumes are defined by exceedance of maximum contaminant levels (MCLs). The locations of these plumes are shown on Figure D-3, are identified by their physical location (not necessarily by their source), and include:

- OU 1 Plume
- OU 2 Plume
- IHSS 118.1 Plume (Carbon Tetrachloride)
- OU 7 Plume (Landfill)
- Industrial Area Plume

Each of these plumes is discussed below.

The principal source of contaminated groundwater is the contaminated soils in OU 1, which would be excavated, thereby removing this source of groundwater contamination. Since the source of groundwater contamination would be removed, the current French-drain system and groundwater recovery wells would also be removed from operation. Soil (source) excavation was previously discussed.

The principal source areas for the groundwater plume in OU 2 are the Mound Area, the 903 Pad, and the east trenches. All sources (i.e., IHSSs) exceeding Rocky Flats subsurface cleanup levels would be removed. Contaminated groundwater would be collected by funnel and gate systems and directed to reactive treatment systems, which consist of a reactive substrate that degrades VOCs flowing through the system. These systems would be located at the plume front (see Figure D-3). A funnel and gate system consists of an impermeable funnel (typically sheet piling or a slurry wall) placed below ground in the path of contaminant migration. The funnel is used to channel groundwater to a central area or gate. The gate is filled with a reactive media and as groundwater flows through the media the contaminants are destroyed.

The principal source for the groundwater plume near OU 4 is carbon tetrachloride. Known areas of carbon tetrachloride sources near OU 4 would be excavated. The interceptor trench system currently located downgradient of the IHSS 118.1 plume would be dismantled and replaced by a funnel and gate system that would direct contaminated groundwater to a reactive treatment system.

The OU 7 landfill which is the source of that area's plume would be excavated. A reactive treatment system would be installed to treat leachate flowing from the landfill, as an interim measure. Modifications may be required for long-term use.

An impermeable barrier with drains would be installed upgradient of the Industrial Area to prevent the influx of groundwater. This barrier would reduce the movement of groundwater through the Industrial Area and reduce the mobility of the groundwater plume arising from the Industrial Area. Subsurface sources of groundwater contamination would be removed after the buildings were removed. Any groundwater movement out of the Industrial Area would be captured by the IHSS 118.1 and OU 2 collection systems.

Surface Water

The proposed action for Alternative 1, Unrestricted is initially to convert surface water management of the ponds to a flow-through system and then eventually convert the ponds to wetlands after remediation activities are complete. The conversion to wetlands is delayed to maintain the detention system while remedial activities are progressing. Sediments contaminated above the 10^{-6} residential standard would be removed and disposed offsite.

The initial conversion to a flow-through system (controlled detention) is technically simple and relatively easy to implement. This system would include a series of gates that control the flow of surface water, and a continuous monitoring system that would replace the current batch sampling system. This controlled detention system is designed to attenuate variable inflows from the drainage and subsequently release water at a controlled rate.

The final conversion of the pond system to wetlands is also technically simple and is commonly performed for wetland mitigation projects (see Figure D-4). This approach would use the existing pond systems to generate a series of wetlands in the current drainages. To accomplish this, the tops of the dams would be lowered and the material used to partially fill the pond basin along with additional fill as necessary. The partially filled pond basin would have an irregular bottom and a sinuous edge to improve wetland diversity. A stand pipe (culvert) would be used to control water level and a trench lined with riprap (rocks) would be used for overflow during major storm events.

There are several advantages to converting the ponds to wetlands after remediation is completed. These include immobilization of sediments, elimination of dam integrity concerns and an enhancement of the overall ecological system. However, an assessment of the impacts from construction activities would need to be evaluated prior to conversion of the system.

Overall Environmental Monitoring

During remediation activities, environmental monitoring would include monitoring of surface water, groundwater, ecological systems, and emissions generated by remediation activities. The extent of this monitoring would be sufficient to ensure that remediation activities are not adversely impacting human health and the environment. It should be noted that monitoring required in the immediate vicinity of any remediation, as opposed to general environmental monitoring, is designed to provide protection both to the worker and the public.

Following remediation, environmental monitoring would be continued to ensure that remedial technologies and engineered systems were operating as required to provide protection of human health and the environment.

4.1.3 Capital Improvements

There would be very few capital improvements made under Alternative 1, Unrestricted. One capital improvement that might be made is upgrading the pond dam system to ensure integrity since the system does not currently meet required specifications and the ponds would not be converted to wetlands for several years.

4.1.4 Constraints/Standards

For unrestricted land use, cleanup levels would be based on the Programmatic Preliminary Remediation Goals (PPRGs) for Rocky Flats based on a residential alternative and a target cancer risk of 10^{-6} or a hazard quotient of 1 for noncarcinogens. The PPRGs are specific for each environmental medium, including soil, groundwater, surface water, and stream and pond sediment. It should be noted that in some cases, the PPRGs for radionuclides and/or metals may not be achievable due to background levels of these constituents or to laboratory quantification limitations (i.e., detection limits are higher than the PPRG). In addition to consideration of the PPRGs, an Applicable or Relevant and Appropriate Requirements (ARAR) analysis may be required to ensure that the Site meets the criteria for unrestricted release.

Following remediation activities, a multimedia dose analysis would be performed to show that any potential dose to the public from residual contamination was less than dose limits deemed protective by DOE, CDPHE, and EPA. By the time this analysis would be done, the promulgated limit is expected to be 15 mrem per year to any one individual.

4.1.5 Barriers/Uncertainties/Assumptions

The barriers, uncertainties, and assumptions associated with Alternative 1 are listed below:

- Groundwater would be modeled to address dewatering of the Site after the completion of D&D activities. This modeling would also be used to determine if sufficient water would be available to support conversion of the Pond systems to wetlands.

- Some waste would be remediated by decommissioning during demolition activities (e.g., UBC).

- The windblown plutonium contaminated area on the eastern portion of the Site would be excavated to a depth of 1 foot.

- Excavation of OU 5 would not impact the ecological habitat (e.g., Prebles Meadow Jumping Mouse habitat).

- Additional NA/NFA criteria may be required (e.g., institutional controls) in the event it proved technically impracticable to remediate all areas to a 10^{-6} risk level.

4.1.6 Analysis and Results

The unburdened cost for Alternative 1, Unrestricted, is presented in Table D-2. The estimated cost for environmental restoration is $728 million and does not include waste disposal. The annual Operations and Maintenance cost estimate during remediation is $11.9 million and after the remedy is implemented is $3.5 million.

4.1.7 Special Analysis: Background

The following is a brief synopsis that incorporates portions of Alternative 1, Unrestricted, with several other unique attributes and therefore necessitates special analysis. The primary attribute of this alternative is the remediation of both onsite and offsite contamination to background levels. This differs from the preceding description of Alternative 1 which established cleanup criteria at 10^{-6} residential standards.

In this alternative the cleanup of onsite and offsite contamination would be conducted to background levels. The IHSSs would be remediated to background levels and the volume of waste generated would be approximately 1.6 million cubic meters or approximately 30 percent greater than the volume of waste generated in the residential alternative. This waste would be shipped for offsite disposal. This volume is small in comparison to the amount of waste that would be generated from remediation of wind-blown plutonium contamination both onsite and offsite.

Two data sets were used to determine the extent of wind-blown contamination. These data sets and their associated maps are included in the RFI/RI report for OU 3 (August, 1995). The first map uses a ratio to compare levels to background concentrations at levels two standard deviations above the mean background concentration. An isopleth was approximated using the points above this level and was continued around the western portion of the plant. This area is approximately 8,400 acres in extent and would require the removal of 10.2 million cubic meters of material by excavating the area to a depth of 1 foot (this includes sediments in lakes and ponds in the area). This approach would represent the minimum amount of waste that would need to be removed to meet background levels.

The second data set is a kriged-data file from M. Iggy Litaor (EG&G, January, 1995). The map generated from this data set uses a simple isoconcentration plot for the concentrations detected. An isopleth was approximated using the .08 pci/g isopleth and estimated for the western portion of the plant. This area is approximately 25,500 acres in extent and would require the removal of 30 million cubic meters of material by excavating the area to a depth of 1 foot (this includes sediments in lakes and ponds in the area). This approach represents the conservative (maximum) amount of waste that would need to be removed to meet background levels.

The range of quantity of waste that would need to be remediated to achieve background would be between 11.8 and 31.6 million cubic meters. It should be noted that revegetation of the disturbed area (and a source for the amount of top soil required) and the moving of existing structures (i.e., houses) was not considered in this analysis. In addition, the remediation of this area could make DOE potentially liable for a natural resource damage claim because rare ecological species might be sacrificed. The approximate excavation and disposal costs associated with this alternative would range from $36 to $98 billion.

4.1.8 Special Analysis: Unrestricted Open Space/Industrial Use Standards

The following is a brief synopsis that incorporates portions of the Unrestricted Alternative with several other unique attributes and therefore necessitates special analysis. The primary attribute of this alternative is the remediation of the Site to unrestricted open space or industrial standards for the entire Site. This differs from the preceding description of Alternative 1 which established cleanup criteria at 10^{-6} residential standards.

In this alternative the cleanup criteria for onsite contamination would be applied to unrestricted open space/industrial levels. The IHSSs would be remediated to open space criteria and the volume of waste generated would be approximately 520,000 cubic meters. This waste would be stored/disposed of onsite in containers and placed in a low-level waste storage facility. OU 7 would be capped in place and OU 5 would be removed, containerized and placed in the storage/disposal cell. Groundwater would be controlled to negotiated standards with a series of reactive barriers. The surface water management system would be converted to a flow-through system and eventually to wetlands (same as Alternative 1). There would not be a final cover in this alternative.

The cost for this special analysis would be approximately $17 billion with a 30-year life cycle. The annual operation and maintenance costs during remediation are estimated at $11.9 million. After the remedy is implemented, the O&M cost would be $4.9 million, and after the TRU waste and SNM are offsite the cost would be $4.2 million.

4.2 Alternative 2, BEMR I

BEMR is a mandatory annual report from DOE headquarters to Congress that provides projections of scope, schedule, and total life-cycle costs for all Environmental Management activities at the Site. This alternative represents early Site life-cycle planning whereby the Site would be remediated to 10^{-5} open-space standards for the buffer zone and 10^{-4} industrial standards for the Industrial Area. The estimated cost for this alternative ranges between $22 and $38 billion (unescalated) with cleanup activities being complete by 2060. A more complete description of BEMR can be found in Appendix I.

4.3 Alternative 3, Retrievable and Monitored

4.3.1 Alternative Description

The following is a description of environmental restoration components as they would occur under Alternative 3, Retrievable, Monitored Storage and Disposal. The cleanup standard for these alternatives is based on a presumed land use as shown in Figure D-5 (all acre values are approximate).

- The outer 5,100 acres of buffer zone would support unrestricted open-space use. The low-level plutonium contaminated area on the eastern side of the Site would be included.
- An inner 842 acres of buffer zone would meet standards for use as unoccupied (i.e., restricted) open space.
- An area of 100 acres would be available for a potential future industrial conversion area that would meet criteria for commercial, office, or industrial use.
- An area of 53 acres would be the closed existing landfills meeting open-space criteria but with institutional prohibitions against excavation.
- An area of 66 acres would be capped and would include the Protected and 800 Areas meeting open-space criteria but with institutional controls prohibiting excavation.

Approximately 55 IHSSs have currently been identified for remediation and others may require remediation as data become available. This would include excavating and disposing of 180,000 m^3 of waste from the most heavily contaminated areas on the Site and treating 135,000 m^3 of this excavated waste.

The groundwater at the Site would be controlled to negotiated standards with a series of reactive barriers (similar to Alternative 1, Unrestricted, except the barriers would be in different locations and treatment standards would be different). The surface-water ponds would initially be converted to a flow-through system and then be converted to wetlands after the completion of remedial activities (same as Alternative 1).

A final cover or cap would be placed over the wastes in the Protected Area and in the new waste management facilities to prevent contact and inhibit contaminant migration. There would be a total of three caps in the PA over the 700 area, 371/374 area, and the waste management facility. The waste for this cover would be mined near the Site. The existing landfills would be closed using a presumptive remedy (i.e., capping) for OU 7. Excavation and placement in an onsite waste management facility would be the approach for OU 5 (70,000 m^3).

Near-term institutional controls would be initiated and would include deed restrictions, fences around the unoccupied open space, and postings.

4.3.2 Subtasks

Alternative 3 has been divided into six specific subtasks and includes IHSSs, Landfills, Contaminated Groundwater, Surface Water, a Final Cover and Overall Environmental Monitoring. The following sections provide detail for each subtask and describe how the individual components contribute to achieving the described alternative.

IHSSs

The description of the two categories of IHSSs, PACs, and UBCs is as follows:

- High Ranked IHSSs: Under this option, the criteria for high category IHSSs, PACs, and UBCs are those locations that have high levels of contamination and contain the source of that contamination (primarily mobile contaminants such as VOCs in percent concentrations). The 55 IHSSs that currently have been ranked high would be remediated. Table D-3 presents the high-ranked IHSSs and the volume of waste and treatment technology associated with each IHSS. The IHSSs categorized as high are listed by numerical order. The IHSSs would be sequenced in the future based on risk, accessibility, and funding. In addition, these IHSSs are shown graphically in Figure D-6. Since the PACs and UBCs have not been adequately characterized, it was assumed that 20 percent would require remediation.

  Alternative 3 includes excavation of these high-ranked IHSSs followed by low temperature thermal desorption treatment, if necessary, and final disposal in an onsite waste management facility or offsite disposal. The final disposition of this waste is discussed in more detail in Appendix B, Waste Management. A total of 180,000 m^3 would be excavated and it was assumed that 75 percent of this waste would be thermally desorped (135,000 m^3) under this option.

- Low Ranked IHSSs: Under this alternative, the criteria for low category IHSSs, PACs, and UBCs are those locations that do not meet the high criteria. There are currently 112 IHSSs that have been ranked low. Table D-3 presents the low-ranked IHSSs.

  The sites ranked as low will undergo the NA/NFA Decision Criteria. The justification for NA/NFA is discussed in Section 4.1.2 under IHSSs.

Existing Landfills

Under the Alternative 3 series, the following remediation would be proposed for the two existing landfills:

- OU 7 is an active RCRA Subtitle D sanitary landfill and would undergo closure in place with a cap designed to stabilize the contents and prevent exposures to workers and the public. In addition, limited monitoring might be required to evaluate the effectiveness of the cap since the landfill does contain some hazardous waste. This monitoring might be incorporated into the sitewide monitoring program after environmental restoration has been achieved.

- OU 5 is the old sanitary landfill and is considerably smaller than OU 7. The contents of OU 5 would be excavated, treated if necessary, and disposed onsite in one of the new waste management cells (70,000 m^3), primarily to reduce the contaminated area (foot print) at the Site.

Contaminated Groundwater

Under Alternative 3, contaminated soils in OU 1 would be excavated, thereby removing the majority of the source of groundwater contamination. With the source of groundwater contamination removed, the current French-drain system and recovery wells would be removed from operation.

In OU 2, all sources exceeding Rocky Flats subsurface cleanup levels would be removed. Contaminated groundwater would be collected by funnel and gate systems and directed to reactive treatment systems which consist of a reactive substrate that degrades VOCs flowing through the system. The capture structures would be located at the front boundaries of the 100 x MCL plume where surface water is determined to be potentially at risk (see Figure D-7). This is the same approach that would be used in Alternative 1, Unrestricted; however, the remediation standards would be different.

Known areas of carbon tetrachloride sources would be excavated near OU 4. The interceptor trench system currently located downgradient of the IHSS 118.1 groundwater plume would be dismantled. An impermeable barrier would be installed to contain the portion of the plume that exceeds the 100 x MCL contaminant concentration.

A reactive treatment system would be installed to treat leachate flowing from the landfill, as an interim measure. Modifications may be required for long term use.

An evaporative cap would be installed over the Industrial Area to limit natural recharge and leaching. This would reduce the movement of groundwater through the Industrial Area and reduce the mobility of the groundwater plume. Subsurface sources of groundwater contamination would be removed after buildings are removed. Any groundwater movement out of the Industrial Area would be captured by the OU 2 collection systems.

Surface Water

This section addresses management of the surface water flowing through and off the site. Surface water is currently allowed to collect in the pond system, is sampled, and is then released in a batch style. This system is effective under most conditions but costly, and difficulty is encountered when large storm events occur and the retention system is already at or near capacity.

The proposal for Alternative 3 is initially to convert surface-water handling to a flow-through system and then eventually convert the ponds to wetlands after remediation is complete. The conversion to wetlands would be delayed to maintain the detention system while remedial activities are progressing. Although pond IHSSs are currently ranked as a low category IHSS, remediation might need to be conducted based upon negotiated standards and stakeholder and regulator input.

The initial conversion to a flow-through system (controlled detention) is technically simple and relatively easy to implement. This system would include a series of gates that would control the flow of surface water, and a continuous monitoring system that would replace the current batch-sampling system. This controlled detention system would attenuate variable inflows from the drainage and release water at a controlled rate. The materials under the 371/374 and 700 area caps would be small amounts of demolition debris containing limited amounts of hazardous LL and LLMW. Residues from the IHSS that could not be fully remediated would also be left in the area. The cap over the waste management facility would contain hazardous LL and LLMW from remediation and demolition activities.

The final conversion to wetlands for the pond system is also technically simple and is commonly performed for wetland mitigation projects (see Figure D-4). This approach would use the existing pond systems to generate a series of wetlands in the current drainages; the tops of the dams would be lowered and the material used to partially fill the pond basin along with additional fill as necessary. The partially filled pond basin would have an irregular bottom and a sinuous edge to improve wetland diversity. A stand pipe would be used to control water level and a riprap-lined trench would be used for overflow during major storm events.

There would be several advantages to converting the ponds to wetlands after remediation was completed. These include immobilization of sediments, elimination of dam integrity concerns, and an enhancement of the overall ecological system.

Final Cover

After remediation activities and Site decommissioning are completed, any new waste management facilities would be appropriately closed and the general area consisting of the 371/374 area, the 700 area, and the waste management facility in the PA would be covered with a cap. This would minimize the contaminated footprint for the Site and allow for future retrievability for the waste emplaced under the waste management facility cap, if required.

The cap size over the 371/374 area is estimated to be 10 acres, 43 acres over the 700 Area, and 13 acres over the waste management facility. The cap would include the following:

- A capillary break to enhance evapotranspiration
- A bioexclusion layer to prevent burrowing rodents and tree roots from penetrating the impermeable liner
- A drainage layer to transport excess water away from the cover and waste material
- An impermeable, impenetrable liner system to prevent infiltration

A plan view and typical cross sectional view of the covers are shown in Figures D-8 and D-9, respectively. The cap, waste emplacement methods, and groundwater management systems would be integrated to be protective of human health and the environment.

Three primary types of borrow material have been targeted:

- Low permeability soil - fine grain material or soil types with high clay and silt fractions
- Structural fill - optimally having the ability to serve miscellaneous functions and support a vegetative cover
- Riprap material - drainage material

Preliminary estimates of wastes and volume requirements are approximately 250,000 cubic yards of low permeability soil, 550,000 cubic yards of structural fill material and 350,000 cubic yards of riprap.

Two offsite sources potentially could supply the anticipated borrow material required: Western Aggregates, Inc. (WA) and the Varra Quarry. Both of these sources have the materials required, except for the larger size riprap. According to representatives of WA, the volumes of borrow material required are within the means of the facility. As of 1994, Varra Quarry lacked a permit for the volume of material required for the cap. The riprap borrow source is of some concern because of the lack of angular riprap at or near the Site. However, the potential borrow source could come through either of these offsite facilities as well.

The capped areas could then be used as open space during the day; however, excavation and structures would be prohibited because these activities would compromise the integrity of the cap.

Overall Environmental Monitoring

During remediation activities, environmental monitoring would include monitoring of surface water, groundwater, ecological systems, and emissions generated by remediation activities. The extent of this monitoring would be sufficient to ensure that remediation activities were not impacting human health and the environment. It should be noted that monitoring required in the immediate vicinity of any remediation, as opposed to general environmental monitoring, is designed to provide protection both to the worker and the public.

Following remediation, monitoring would continue to ensure that groundwater controls and barriers were functioning as required and that the cap and onsite waste facilities were not breeched. Monitoring would also continue to demonstrate that the caps were functioning as designed; i.e., to prevent contact with and inhibit migration of contaminants.

4.3.3 Capital Improvements

This is the same as discussed in Alternative 1, Unrestricted (see Section 4.1.3).

4.3.4 Constraints/Standards

An Interagency Standards Working Group evaluated risk-based values (i.e., risk-based PRGs, ARARs and DOE Orders) and determined cleanup levels by media based on the Rocky Flats Vision statement. These draft cleanup action levels are summarized below.

Surficial Soils

- Nonradiological action levels will be based on site-specific PPRGs based on appropriate land use receptors.

- Radiological action levels will be based on a 15 MREM effective dose equivalent and management of areas exceeding a 10^{-6} open-space risk level.

Subsurface Soils

- The U.S. EPA Soil Screening Guide will be used to back-calculate VOC soil action levels to prevent leachate at 100 times the MCL from impacting groundwater.

- Radiological action levels will be based on a 15 MREM effective dose equivalent which equates to the construction worker PRG at the 10^{-6} risk level.

Groundwater

- The need for groundwater remediation will be determined by the need to protect surface water or ecological resources.

- If the Site is required to follow RCRA closure requirements then more groundwater monitoring may be required.

- There will be a two-phased approach to the application of action levels and triggering of actions dependent on contaminant concentrations and locations within a groundwater plume. In addition, the current agreed-upon groundwater monitoring network will be fully utilized to determine the configuration of the contaminant plumes and changes in hydrologic conditions. The two phases are as follows:

— Tier 1 - Action levels of 100 X MCLs will trigger remediation or management actions where appropriate.

— Tier 2 - Exceedances of MCLs at wells located downgradient of groundwater plumes near surface water will trigger a different sequence of actions including evaluation and remediation where appropriate.

Surface Water

Surface water standards were divided into two phases: Active remediation and end-state achievement of the Vision Statement. The active phase is the time period between now and achievement of ASAP goals when active remediation and risk reduction will be occurring.

The Active Phase standards for planning purposes are:

- The point of compliance is at the outfall of terminal ponds for nonradiological contaminants.

- The point of evaluation is at the outfall of terminal ponds for radiological contaminants.
- Stream standards for nonradiological contaminants will be Agricultural, Warm Water Aquatic 2, and Recreational 2.

- The action level for ponds is 0.15 pCi/L for Pu or Am for a 30-day average, (a temporary modification to this action level is being negotiated for the period when risk-reduction activities associated with liquid stabilization, and tank and line rinsing, occur.).

- Storm events will have temporary standards for radionuclides at the outfall of ponds based on a 30-day average.

The end-state standards for planning purposes are:

- The point of compliance is at the outfall of terminal ponds for nonradiological contaminants.
- The point of evaluation is at the outfall of terminal ponds for radiological contaminants.
- The action level for Pu or Am is 0.15 pCi/L for a 30-day average.
- The stream standard for nonradiological contaminants will be Warm Water Aquatic 2, Recreational 2, and Water Supply.

4.3.5 Barriers/Uncertainties/Assumptions

The barriers, uncertainties, and assumptions associated with Alternative 3 are:

- Groundwater would be modeled to address dewatering of the Site after the completion of D&D activities and placement of final cover. This modeling would also be used to determine if sufficient water was available to support conversion of the pond systems to wetlands.
- Agreement will be reached in early 1996 on cleanup standards similar to those assumed in Subsection 4.3.4.
- Approximately 20 percent of UBCs and PACs will be excavated, treated, and disposed. The remaining waste will remain in place.
- Additional NA/NFA criteria, such as institutional controls, may be required.
- The Site may need a temporary modification of the 0.15 pCi/L standard for plutonium or americium for the period when risk reduction activities associated with the liquid stabilization and tank and line rinsing occur. If the modification is not granted, then additional capital and operating costs for wastewater treatment totalling $72 million would be required.
- Long-term (greater than 100 years) institutional controls need to be developed for the final cover, which could include above- and below-ground markers.
- Further investigation of methods to minimize settlement of the final cover due to demolition debris.
- The cover design based on modeling of groundwater and surface water impacts would be completed.
- Groundwater management strategy would need to be integrated with the final cover design.

4.3.6 Analysis and Results

The unburdened cost for this option is presented in Table D-4. The estimated cost for environmental restoration is $222 million and does not include waste disposal. The annual operations and maintenance costs during remediation are estimated at $11.9 million. After the remedy is implemented, the O&M cost is $4.9 million, and after the TRU waste and SNM are offsite, is $4.2 million.

4.3.7 Special Analysis: Future Site Use Working Group

The following is a brief synopsis that incorporates portions of Alternative 3 with several unique attributes that are not contained in other alternatives and therefore necessitates special analysis. The attributes that are contained in this alternative are primarily from the Rocky Flats Future Site Working Group Report, June 1995. This analysis will focus strictly on environmental restoration activities.

This alternative would initially include remedial activities similar to those found in Alternative 3 with some distinct differences. These differences include no final cover (cap), no waste disposal onsite (although near-term storage would be allowed), an emphasis on protection of the natural ecosystem during remedial activities, and initial cleanup to industrial standards, which would limit the potential migration of contaminants. In subsequent phases of this alternative, remediation would continue as technology became available until background levels are achieved (similar to Alternative 1) even if considerable amounts of time are required for technology development and implementation. During these later phases, all waste would be shipped offsite for disposal.

In addition to recommending cleanup levels, recommendations for future site uses are included that encompass the constraints of sensitive habitats at the site. The recommendations for future site uses include areas designated for open spaces, mining and mining-area habitat conservation, cleanup areas and areas designated for environmental technology development/implementation. Other areas are designated for commercial/office/light industrial and include potential construction of a regional transportation parkway. Considerable effort was expended to balance the future Site land use decisions with the constraints of high and moderate sensitive habitat areas and areas potentially designated for tall grass prairie conservation areas.

The initial costs associated with this special analysis range from $17 to $18 billion. This does not include additional costs that would be incurred in the future for cleanup to background levels with technologies yet to be developed.

4.4 Alternative 4, Mothball

4.4.1 Alternative Description

The following is a description of environmental restoration components as they would occur under Alternative 4, Mothball. The cleanup standard would be based on a presumed land use as shown in Figure D-10 (all acre values are approximate).

- Approximately 5100 acres of unrestricted open space, including the low-level plutonium contaminated area on the eastern side of the Site
- Approximately 760 acres of restricted open space
- An area consisting of 100 acres available for potential future industrial/commercial conversion
- An area of approximately 130 acres of vacant facilities unsuitable for reuse
- Approximately 66 acres consisting of closed landfills (existing landfills, Corrective Action Management Units and low-level and low-level mixed waste facilities) that would meet open space criteria but would have institutional prohibitions against excavation

Currently, 49 IHSSs have been identified for remediation, and others may require remediation as data become available. However, several IHSSs and UBC would not be remediated at the present time and a containment approach would be instituted for groundwater since several sources in the Industrial Area would remain. The groundwater at the Site would be controlled to negotiated standards using collection drains, pump and treat technologies, and a series of reactive barriers. The surface water ponds would be converted to a flow-through system. The existing landfills would be closed using a presumptive remedy for OU 7 and a simple cover for OU 5.

In addition, this alternative would include excavating and disposing of 115,000 m^3 of waste from the most heavily contaminated areas on the Site and treating 86,000 m^3 of this excavated waste. The waste that would be placed in the waste management facility would be covered with a cap that is of the same design as described in Section 4.3.2 under Final Cover. Near-term institutional controls would be initiated and would include deed restrictions, fences around the unoccupied open space, and postings.

4.4.2 Subtasks

Alternative 4 has been divided into six specific subtasks and includes IHSSs, Landfills, Contaminated Groundwater, Surface Water, Final Cover, and Overall Environmental Monitoring. The following sections provide detail for each subtask and describe how the individual components contribute to achieving the described alternative.

IHSSs

The description of the two categories of IHSSs, PACs, and UBC is as follows:

- High-ranked IHSSs: Under this option, the criteria for high category IHSSs, PACs, and UBCs are those locations that have high levels of contamination and contain the source of that contamination (primarily mobile contaminants such as VOCs in percent concentrations) and would be remediated. Under this alternative, there would be locations, such as UBCs and 6 IHSSs (146.1-146.6), that cannot be accessed since the buildings would remain intact. In addition, the volume excavated has decreased from the level of Alternative 3 because the buildings remain intact and not all of the source area could be excavated. There are currently 49 IHSSs that have been ranked high. Table D-5 presents the high-ranked IHSSs and the volume of waste and treatment technology associated with each IHSS. The IHSSs categorized as high are not listed by priority. The IHSSs would be prioritized in the future based on risk, accessibility, and funding. These IHSSs are shown graphically in Figure D-11. Since the PACs have not been adequately characterized, it was assumed that 20 percent would require remediation.

  This option includes excavation of these high-ranked locations followed by low-temperature thermal desorption treatment, if necessary, and final disposal in an onsite waste management facility or offsite disposal. The final disposition of this waste is discussed in more detail in Appendix B, Waste Management. A total of 115,000 m^3 would be excavated and it was assumed that 75 percent of this waste would be thermally desorped (86,000 m^3) under this option.

- Low-ranked IHSSs: Under this alternative, the criteria for low category IHSSs, PACs and UBCs are those locations that do not meet the high criteria. There are 118 IHSSs that have been ranked low; and this number includes the IHSSs that cannot be accessed. Table D-5 presents the low-ranked IHSSs.

  The sites ranked as low will undergo the NA/NFA Decision Criteria. The justification for NA/NFA is discussed in Section 4.1.2 under IHSSs.

Existing Landfills

Under Alternative 4, Mothball, the following remediation is proposed for the two existing landfills:

- OU 7 is an active RCRA Subtitle D sanitary landfill and would undergo closure in place with a cap designed to stabilize the contents and prevent exposures to workers and the public. In addition, limited monitoring might be required to evaluate the effectiveness of the cap since the landfill does contain some hazardous waste. This monitoring might be incorporated into the sitewide monitoring program after environmental restoration had been achieved.

- OU 5 would be stabilized in place and capped. The old landfill is on the side of a hill and has historically been unstable. The cap would be designed primarily to stabilize the wastes since the risk from this landfill is small and a RCRA cap is not required.

Contaminated Groundwater

Under Alternative 4, contaminated soils in OU 1 would be excavated, thereby removing the source of groundwater contamination. Since the source of groundwater contamination would be removed, the current French-drain system and recovery wells would be removed from operation.

In OU 2, all sources exceeding Rocky Flats subsurface cleanup levels will be removed. Contaminated groundwater will be collected by funnel and gate systems and directed to reactive treatment systems which consist of a reactive substrate that degrades VOCs flowing through the system. The capture structures would be located at 100 x MCL plume front boundaries (see Figure D-12).

Known areas of carbon tetrachloride sources would be excavated. The interceptor trench system currently located downgradient of the IHSS 118.1 groundwater plume would be dismantled. An impermeable barrier would be installed to contain the portion of the plume that exceeds the 100 x MCL contaminant concentration.

A reactive treatment system would be installed to treat leachate flowing from the landfill as an interim measure. Modifications might be required for long-term use.

Groundwater in the Industrial Area would be collected by connecting existing footing drains and pumped to the existing groundwater treatment plant at Building 891.

Surface Water

The conversion to a flow-through system (controlled detention) is technically simple and relatively easy to implement. This system includes a series of gates that control the flow of surface water and a continuous monitoring system that replaces the current batch sampling system. This controlled detention system attenuates variable inflows from the drainage and releases water at a controlled rate. Although pond IHSSs are currently ranked as a low category IHSS, remediation may be conducted based upon negotiated standards and stakeholder and regulator input. Under this alternative, the pond system would only be converted to a flow-through system since the buildings would still remain and the potential to generate contaminated sediments would exist.

Final Cover

There is a 13-acre cap placed over the Solar Pond and Waste Management Facility Area. The cap design is the same as that described in Section 4.3.2, Final Cover.

Overall Environmental Monitoring

During remediation, environmental monitoring would be used to demonstrate that remediation activities were not affecting human health and the environment.

Following remediation, environmental monitoring would be used to ensure that the caps on the existing landfills (OUs 5 and 7) and proposed facilities were functioning as required. Other engineered barriers/treatments, such as those proposed for groundwater, would be monitored to ensure treatment system performance.

4.4.3 Capital Improvements

There would be few capital improvements made under Alternative 4, Mothball. One capital improvement that might be made is upgrading the pond dam system to ensure integrity. Currently, the dams do not meet required specifications and they would be retained under this alternative.

4.4.4 Constraints/Standards

An Interagency Standards Working Group evaluated risk-based values (i.e., risk-based PRGs, ARARs, and DOE Orders) and determined cleanup levels by media. These cleanup levels are summarized below.

Surficial Soils

- Nonradiological action levels will be based on site-specific PRGs
- Radiological action levels will be based on a 15 mrem effective dose equivalent

Subsurface Soils

- The U.S. EPA Soil Screening Guide will be used to back-calculate VOC soil action levels to prevent leachate at 100 times the maximum contaminant level (MCL) from impacting groundwater
- Radiological action levels will be based on a 15-mrem effective dose equivalent

Groundwater

- The need for groundwater remediation will be determined by the need to protect surface water or ecological resources.
- There will be a two-phased approach to the application of action levels and triggering of actions dependent on contaminant concentrations and locations within a plume. In addition, the current agreed-upon groundwater monitoring network will be fully utilized to determine the configuration of the contaminant plumes and changes in hydrologic conditions. The two phases are as follows:
  - Tier 1 - Action levels of 100 X MCLs will trigger remediation or management actions where appropriate.
  - Tier 2 - Exceedances at Performance Monitoring wells located downgradient of plumes will trigger a different sequence of actions including evaluation and remediation where appropriate.

Surface Water

Surface-water standards were divided into two phases, active and end-state. The active phase is the time period between now and the achievement of whichever ASAP alternative is chosen when active remediation and risk reduction will be occurring. The active phase standards for planning purposes are:

- The point of compliance is at the outfall of terminal ponds for nonradiological contaminants.
- The point of evaluation compliance is at the outfall of terminal ponds for radiological contaminants.
- The action level for ponds is 0.15 pCi/L for Pu/Am (A temporary modification to this action level is being negotiated for the period when risk reduction activities associated with liquid stabilization and tank and line rinsing take place).
- Storm events will have temporary standards for radionuclides at the outfall of ponds based on 30-day average.

The end-state standards for planning purposes are:

- The point of compliance is at the outfall of terminal ponds for nonradiological contaminants.
- The point of evaluation is at the outfall of terminal ponds for radiological contaminants.
- The stream standard for nonradiological contaminants will be Warm Water Aquatic 2, Recreational 2, Water Supply.

4.4.5 Barriers/Uncertainties/Assumptions

The barriers or uncertainties and assumptions associated with this option are:

- Agreement will be reached on cleanup standards in early 1996 and will be similar to those assumed in Section 4.4.4.
- Approximately 20 percent of the PACs will be excavated, treated, and disposed. The remaining waste will remain in place. All of the UBC will remain since it cannot be accessed.
- A temporary modification of the 0.15 pCi/L standard for plutonium or americium will be granted for the period when risk reduction activities associated with the liquid stabilization and tank and line rinsing take place. If the modification is not granted, then additional capital and operating costs for wastewater treatment totalling $72 million will be required.

4.4.6 Analysis and Results

The unburdened cost for this option is presented in Table D-6. The estimated cost for environmental restoration is $81 million and does not include waste disposal. The annual operations and maintenance cost during remediation is estimated at $11.9 million. After the remedy is implemented, the O&M cost is $12.3 million primarily due to the groundwater O&M cost. After the TRU waste and plutonium are offsite, the O&M cost is $11.6 million.

5.0 SUMMARY

A summary of IHSSs to be remediated is provided in Table D-7. In addition, a summary of the three options for Environmental Restoration is provided in Table D-8. The summary includes a description of the proposed action, the volume of waste to be handled if applicable and the capital and O&M cost for each of the subtasks. A summary of each of the subtasks is presented below.

Alternative 1, Unrestricted, involves a larger volume of waste to be excavated and disposed of to meet the cleanup levels based on 10^{-6} residential standard. In addition, this alternative includes excavating approximately 680 acres east of the Industrial Area to remove the low-level plutonium contaminated surface soils. Alternative 4, Mothball has the least amount of waste to be excavated since the buildings will still remain and some of the IHSSs and all of the UBC cannot be accessed.

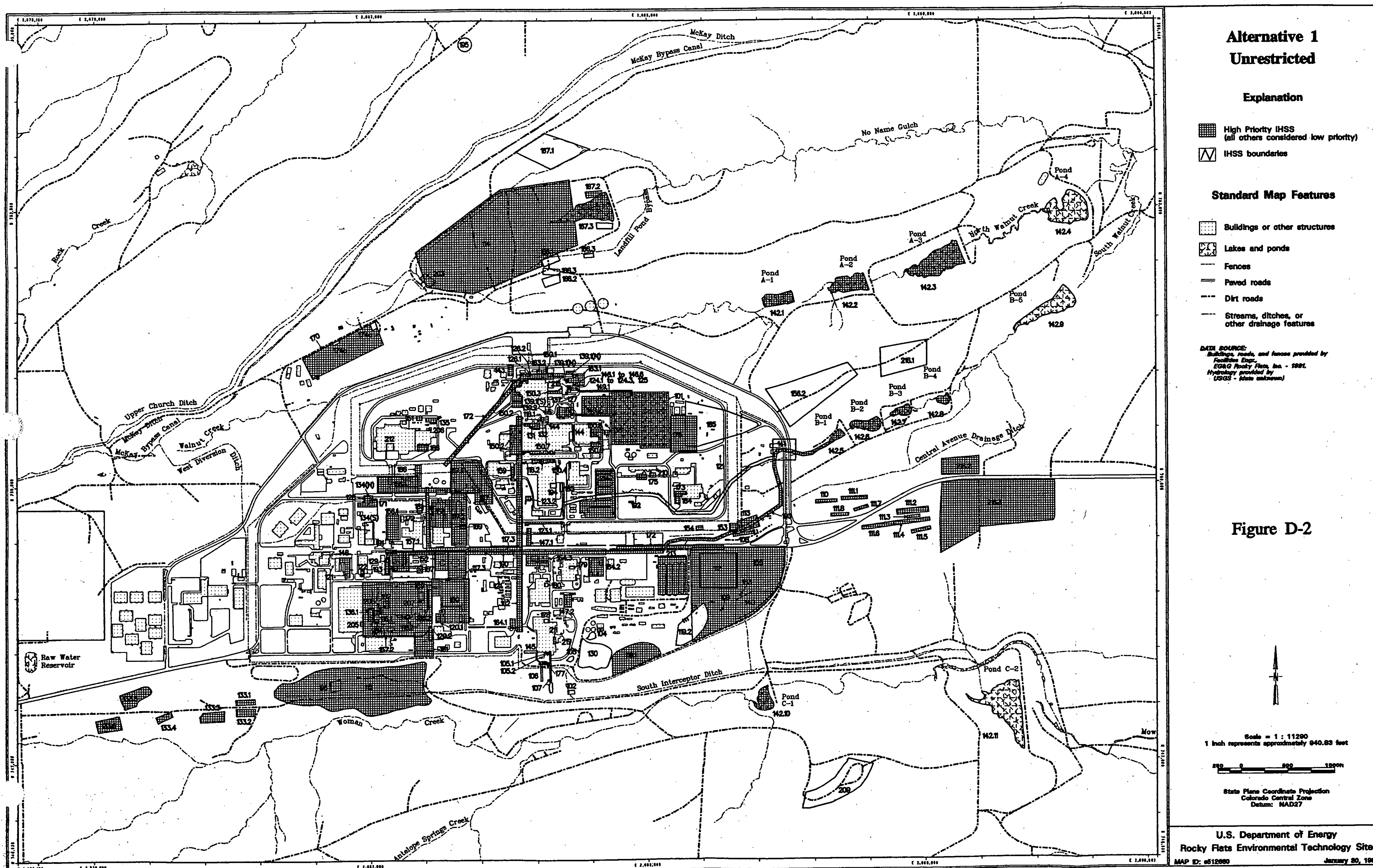
Two options were discussed for the existing landfill (OU 7); closure in place or excavation and disposal. Due to the large volume of waste that is in the landfill (310,000 m^3) it makes economic sense to close the landfill in place, although the trade-off is not reducing the contaminated area of the site. The old sanitary landfill (OU 5) could either be excavated and disposed onsite or offsite or covered. The option to cover the landfill is expensive since the landfill is on a sloping hill and would probably require stabilization prior to covering.

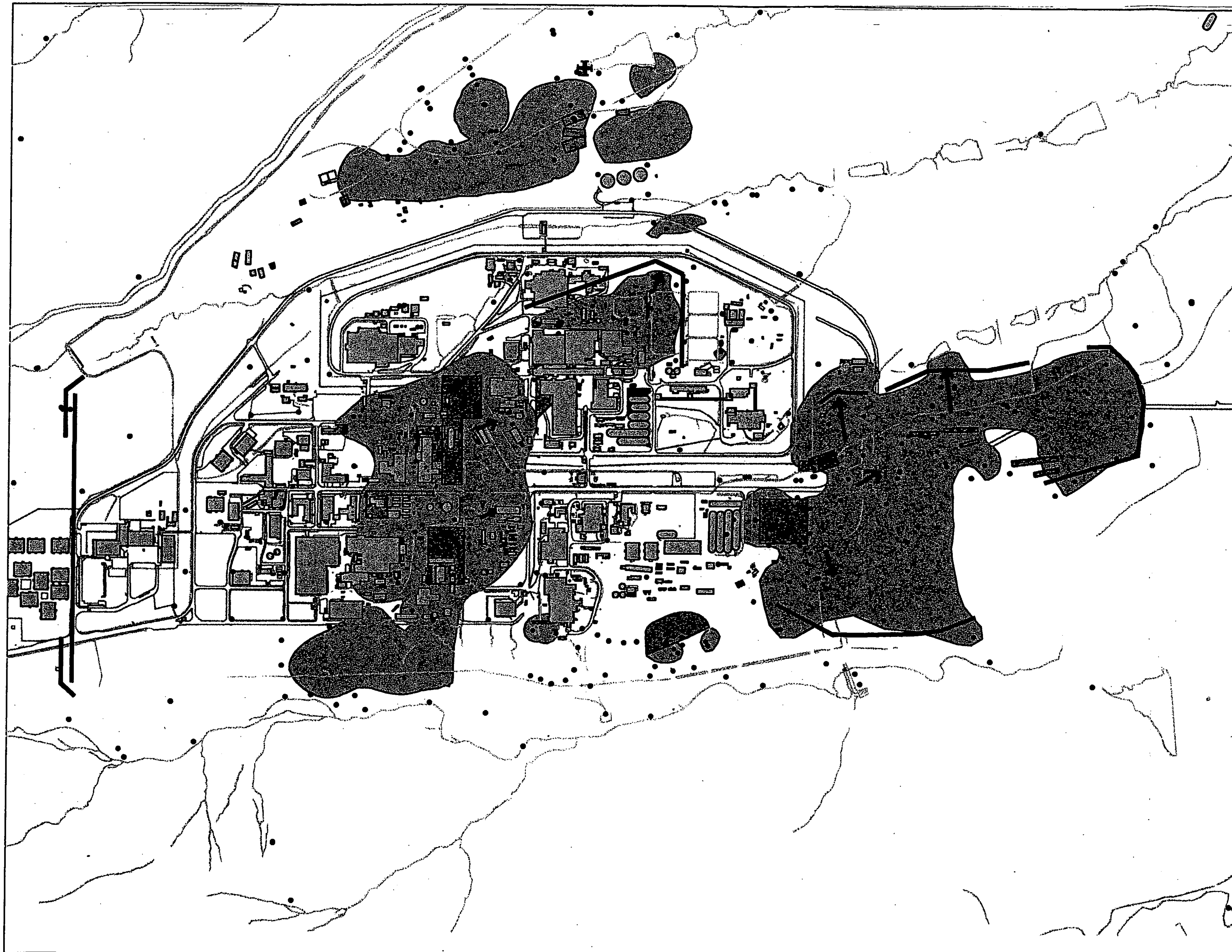
The groundwater system is similar for all of the alternatives in that they all use reactive treatment systems to degrade the VOCs in the groundwater; however, Alternatives 1 and 4 have more extensive management and treatment systems. Alternative 1 is more extensive since the goal is to meet MCLs. Alternative 4 is more extensive since more of the source waste would remain (primarily due to the UBC that remains). In addition, Alternative 1 also would include an upgradient water diversion system to reduce the movement of groundwater through the industrial area.

For both Alternatives 1 and 3, the proposed action for surface water is the same: convert to a flow through system during remediation and once remediation is complete with no facilities remaining that could potentially generate contaminated sediments, convert the pond system to wetlands to immobilize any remaining sediments and enhance the overall ecological system. Under Alternative 4, the pond system would only be converted to a flow-through system since the buildings would still remain and the potential to generate contaminated sediments would still exist.

A Final Cover was investigated only in Alternative 3. The cover would not be required in Alternative 1 due to the extensive remediation that would be conducted. A final cover could not be constructed under Alternative 4 since the buildings would remain. However, Alternative 4 would include an engineered waste management facility.

The environmental monitoring that would be conducted during remediation would be the same for all alternatives. However, the overall cost of Alternative 1 is higher due to the length of time for remediation. After remediation is completed, the long-term monitoring is more expensive for Alternative 3 because of the final cover monitoring.


Alternative 1
Unrestricted
Explanation
High Priority IHSS (all others considered low priority)
IHSS boundaries
Standard Map Features
Buildings or other structures
Lakes and ponds
Fences
Paved roads
Dirt roads
Streams, ditches, or other drainage features
Figure D-2
Scale = 1 : 11290
1 inch represents approximately 940.83 feet
State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27
U.S. Department of Energy
Rocky Flats Environmental Technology Site
January 30, 1996
McKay Ditch
McKay Bypass Canal
No Name Gulch
Landfill Pond Bypass
Rock Creek
North Walnut Creek
South Walnut Creek
Upper Church Ditch
Walnut Creek
West Diversion Ditch
Central Avenue Drainage Ditch
South Interceptor Ditch
Woman Creek
Antelope Springs Creek
Raw Water Reservoir
Pond A-1
Pond A-2
Pond A-3
Pond A-4
Pond B-1
Pond B-2
Pond B-3
Pond B-4
Pond B-5
Pond C-1
Pond C-2



Possible Remediation Installations

Proposed Groundwater Management System Alternative 1: Unrestricted

Contamination extent boundaries represent groundwater sampling results for TCE, PCE, CCl4, and VC.

Figure D-3

LEGEND

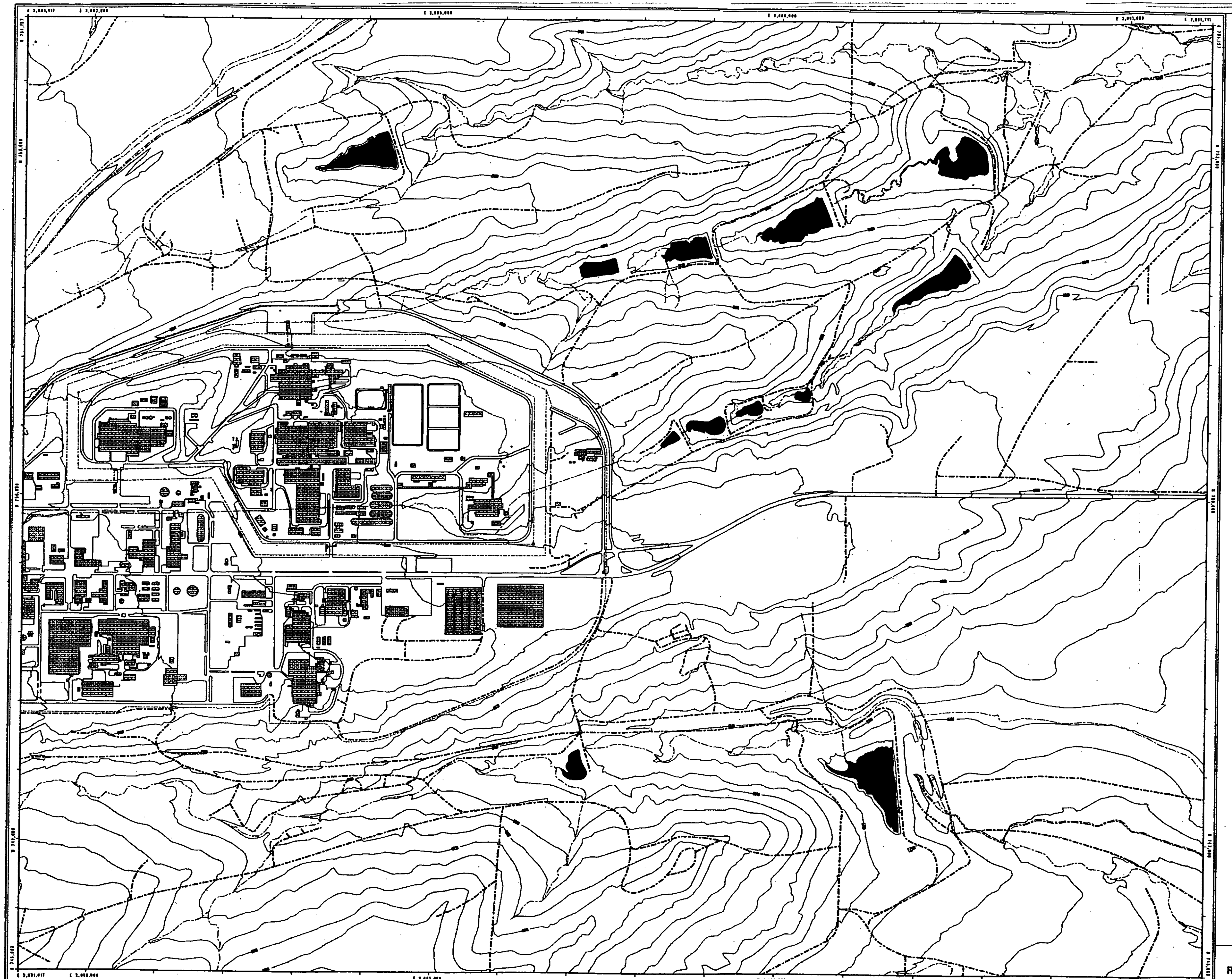
- OU 7 Remediation Installation
- General Groundwater Flow Directio[n]
- Remediation Installations
- Drain System
- Flow Control Wall
- Flow Through Treatment Wall
- Well With Contam. > 100 X MCLs
- UHSU Wells
- Buildings
- Suspected VOA Source
- Pavement
- Surface Drainage
- Concentrations > 5 ppb

Dimensions for remedial installations are approximate and not to scale

N

400 0 400 800 Feet

Proposed Areas for Conversion to Wetlands Alternatives 1 and 3



Explanation

Proposed Area converted to wetlands

Standard Map Features

- Buildings or other structures
- Fences
- Contours (20' Intervals)
- Paved roads
- Dirt roads
- Streams, ditches, or other drainage features

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991
Hydrology provided by USGS - (date unknown)

Figure D-4

Scale = 1 : 9850
1 inch represents approximately 820.83 feet

250 0 500 1000ft

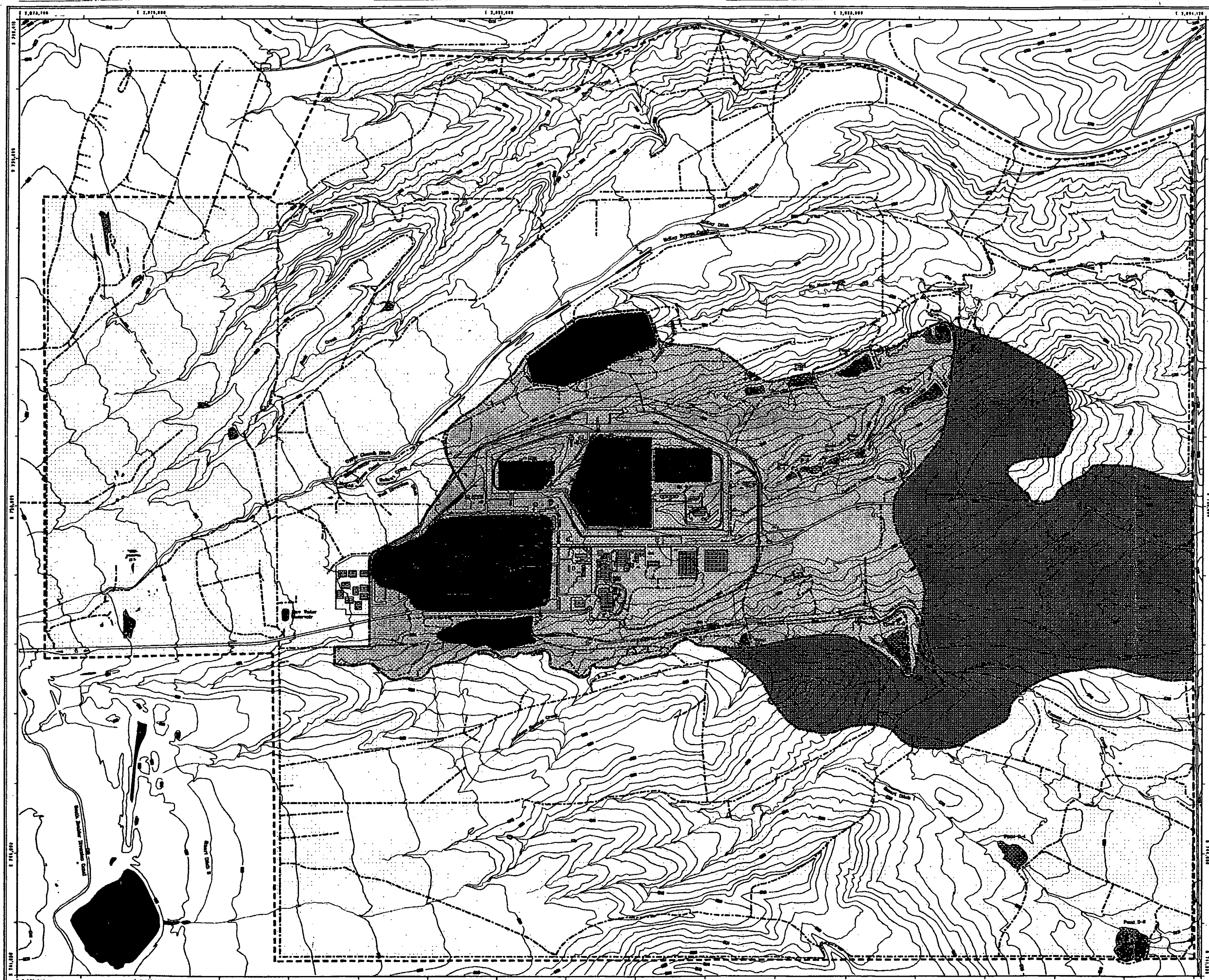
State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

MAP ID: a512660 January 30, 1996

/home/a512660/projects/rakerch/lproveride.aml

Alternative 3
Monitored, Retrievable Storage and Disposal
Proposed Land Use



Explanation of Future Conditions

- Open Space - Unrestricted (4550 Acres)
- Open Space - Restricted (840 Acres)
- Low-level Pu Soil Contamination, surface only (610 Acres)
- Potential Future Industrial - Conversion (100 Acres)
- Closed Landfills (50 Acres)
- Capped Areas (70 Acres)

NOTE:
Further data on each area is contained in "Rocky Flats Conceptual Vision - A Focus For Action"

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Contours (20' Intervals)
- Rocky Flats boundary
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - (date unknown)

Figure D-5

Scale = 1 : 19640
1 inch represents approximately 1636.66 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

MAP ID: e512660 February 13, 1996

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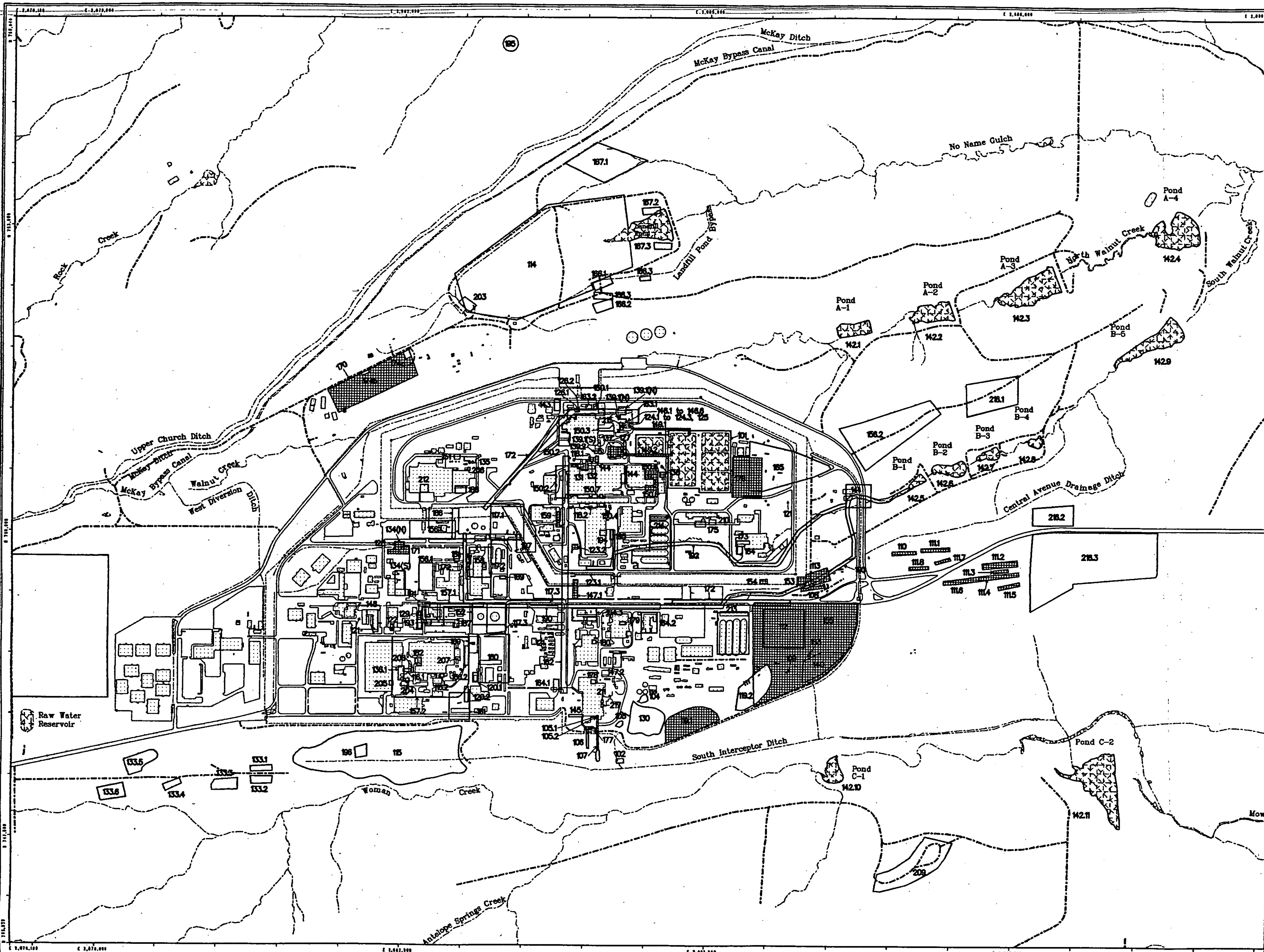

Alternative 3
Monitored, Retrievable Storage and Disposal

Explanation

High Priority IHSS based on suggested alternative ranking (all others considered low priority)

IHSS boundaries

Standard Map Features

Buildings or other structures

Lakes and ponds

Fences

Paved roads

Dirt roads

Streams, ditches, or other drainage features

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - (date unknown)

Figure D-6

Scale = 1 : 11290
1 inch represents approximately 940.83 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

MAP ID: a512660 February 13, 1996

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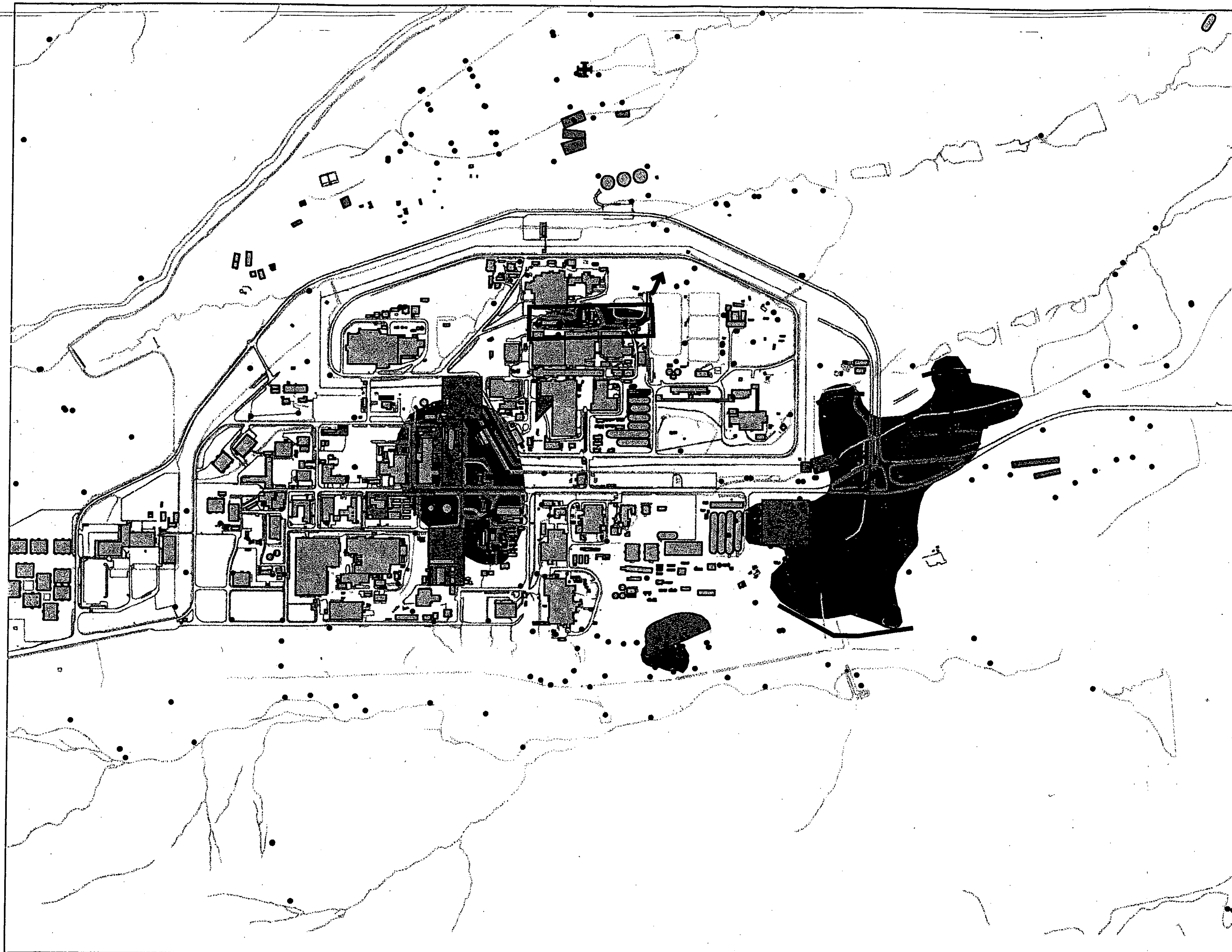


Possible Remediation Installations

Proposed Groundwater Management System Alternative 3: Monitored Retrievable Storage & Disposal

Contamination extent boundaries represent groundwater sampling results for TCE, PCE, CCl4, and VC.

Figure D-7

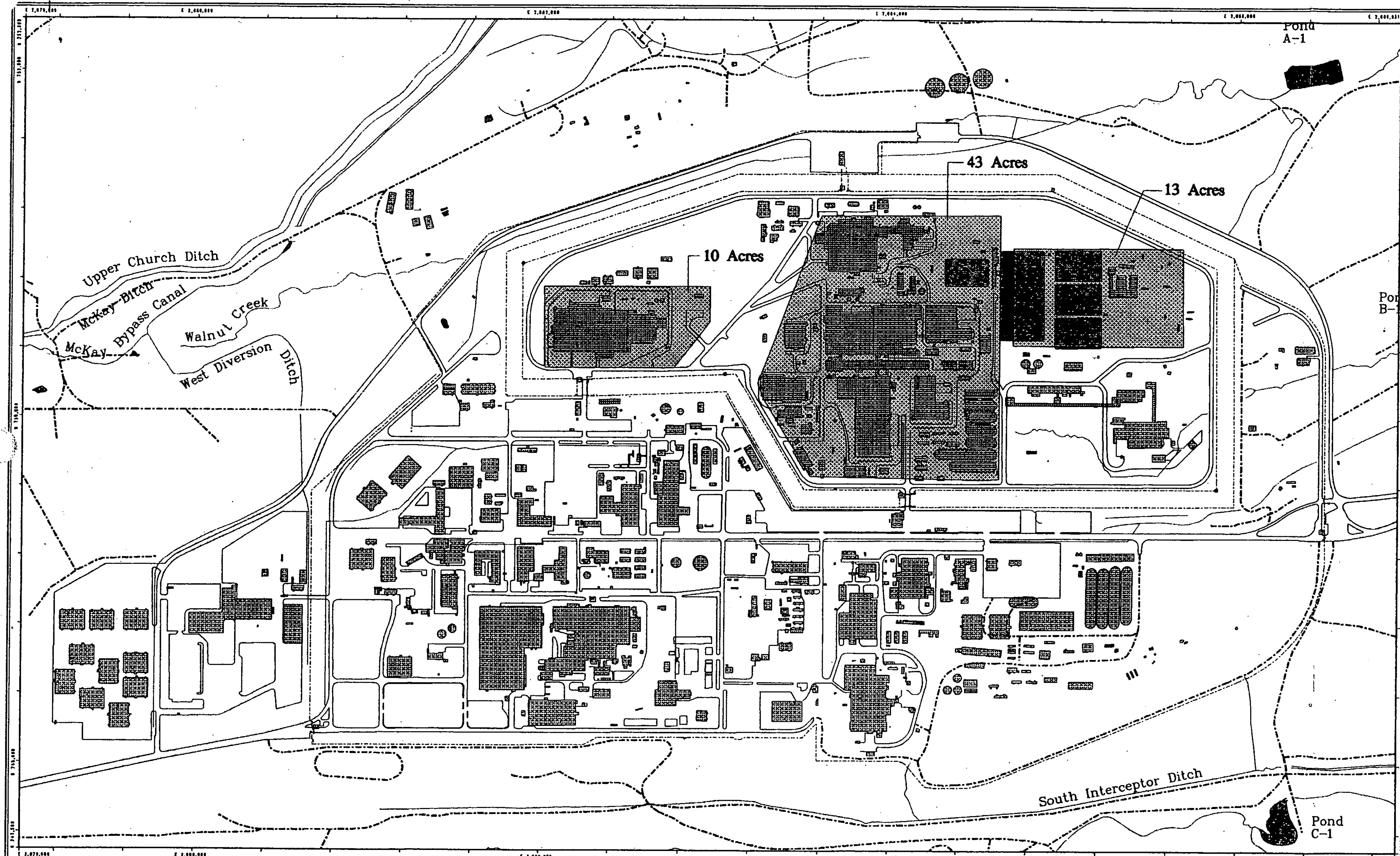
LEGEND

Remediation Installations
- Containment Wall
- Drain System
- Flow Control Wall
- Flow Through Treatment Wall
- OU 7 Remediation Installation
- General Groundwater Flow Direction
- Well With Contam. > 100 X MCLs
- UHSU Wells
- Buildings
- Suspected VOA Source
- Pavement
- Surface Drainage
- Concentrations > 100 X MCLs

Dimensions for remedial installations are approximate and not to scale

N

400 0 400 800 Feet



Plan View of Final Covers

Explanation

Proposed ASAP Caps

Cap over 371/374 Area: (10 Acres)

Cap over 700 Area: (43 Acres)

Cap over Waste Management Facility and Solar Ponds: (13 Acres)

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - (date unknown)

Figure D-8

Scale = 1 : 7270
1 inch represents approximately 605.83 feet

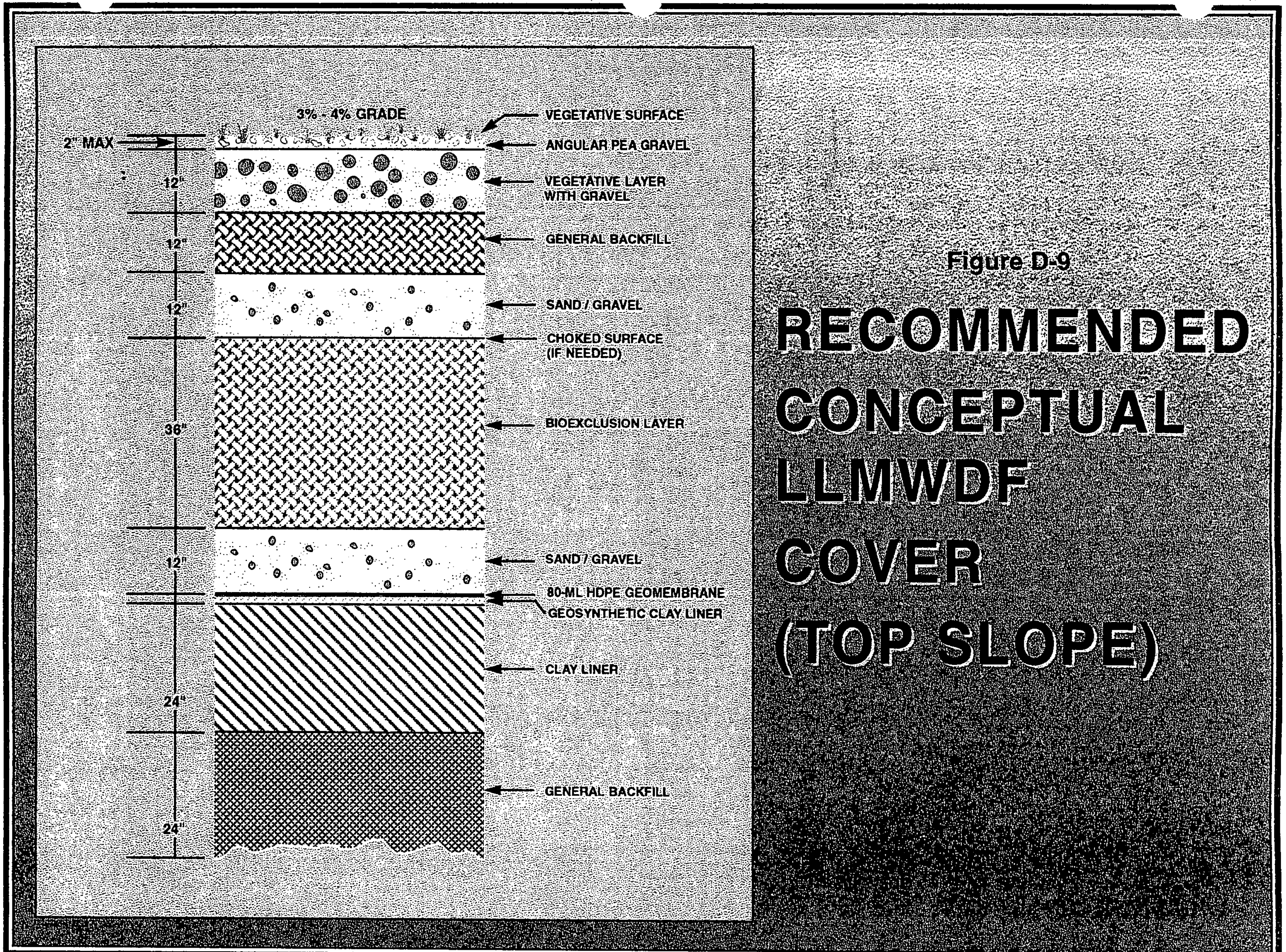
200 0 400 800ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

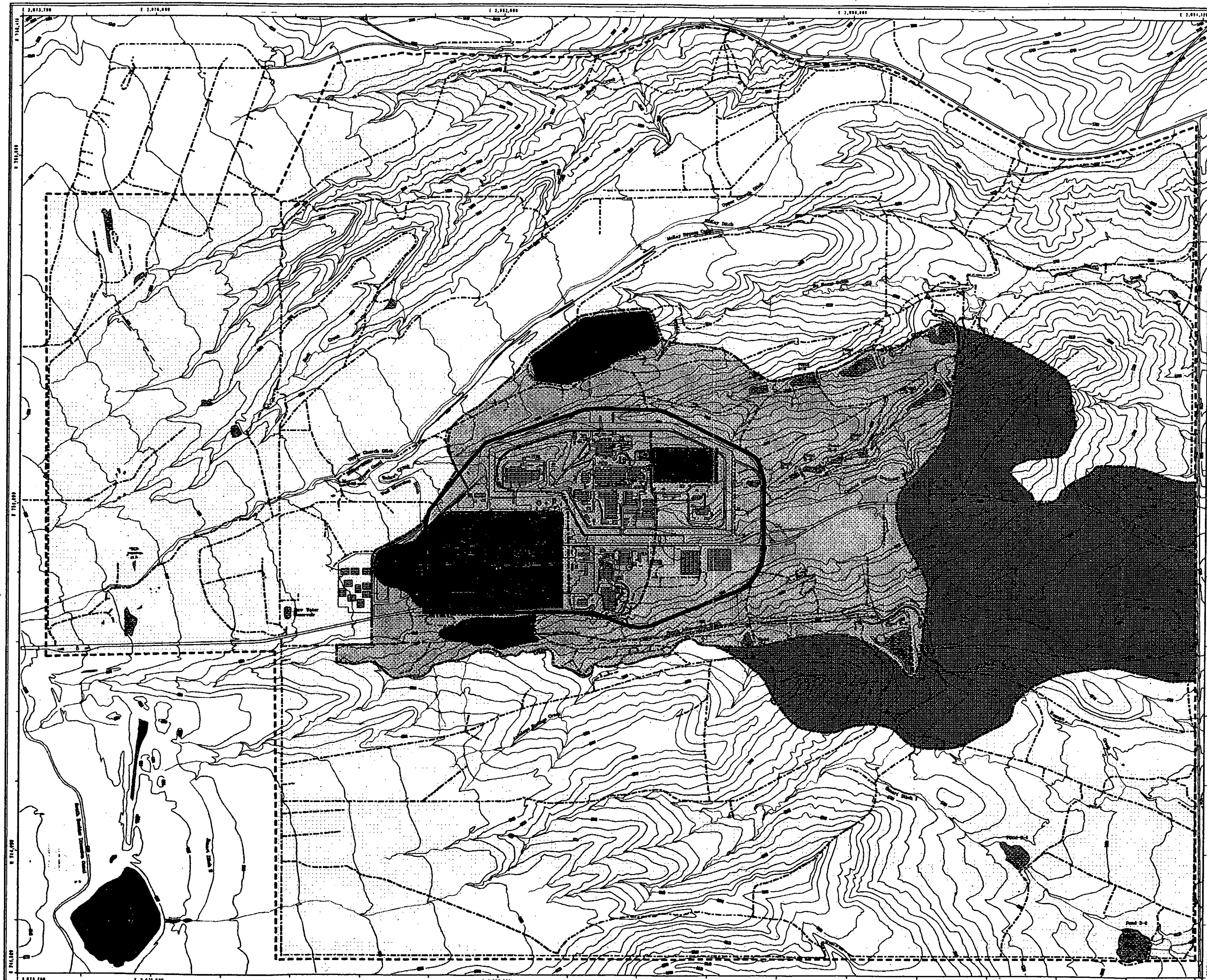
U.S. Department of Energy
Rocky Flats Environmental Technology Site

MAP ID: e512660 February 13, 1996

/home/e512660/projects/kaiser-hill/asap.aml


3% - 4% GRADE
2" MAX
12"
12"
12"
36"
12"
24"
24"
VEGETATIVE SURFACE
ANGULAR PEA GRAVEL
VEGETATIVE LAYER WITH GRAVEL
GENERAL BACKFILL
SAND / GRAVEL
CHOKED SURFACE (IF NEEDED)
BIOEXCLUSION LAYER
SAND / GRAVEL
80-ML HDPE GEOMEMBRANE
GEOSYNTHETIC CLAY LINER
CLAY LINER
GENERAL BACKFILL
Figure D-9
RECOMMENDED
CONCEPTUAL
LLMWDF
COVER
(TOP SLOPE)

Alternative 4: Mothball



Explanation of Future Conditions

- Open Space - Unrestricted (4550 Acres)
- Open Space - Restricted (760 Acres)
- Low-level Pu Soil Contamination, surface only (610 Acres)
- Potential Future Industrial - Conversion (110 Acres)
- Closed Landfills and Waste Management Facilities (70 Acres)
- Vacant Facilities (130 Acres)
- Controlled Access Area (410 Acres)

NOTE:
Further data on each area is contained in "Rocky Flats Conceptual Vision - A Focus For Action"

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Contours (20' Intervals)
- Rocky Flats boundary
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - (date unknown)

Figure D-10

Scale = 1 : 19840
1 inch represents approximately 1636.66 feet

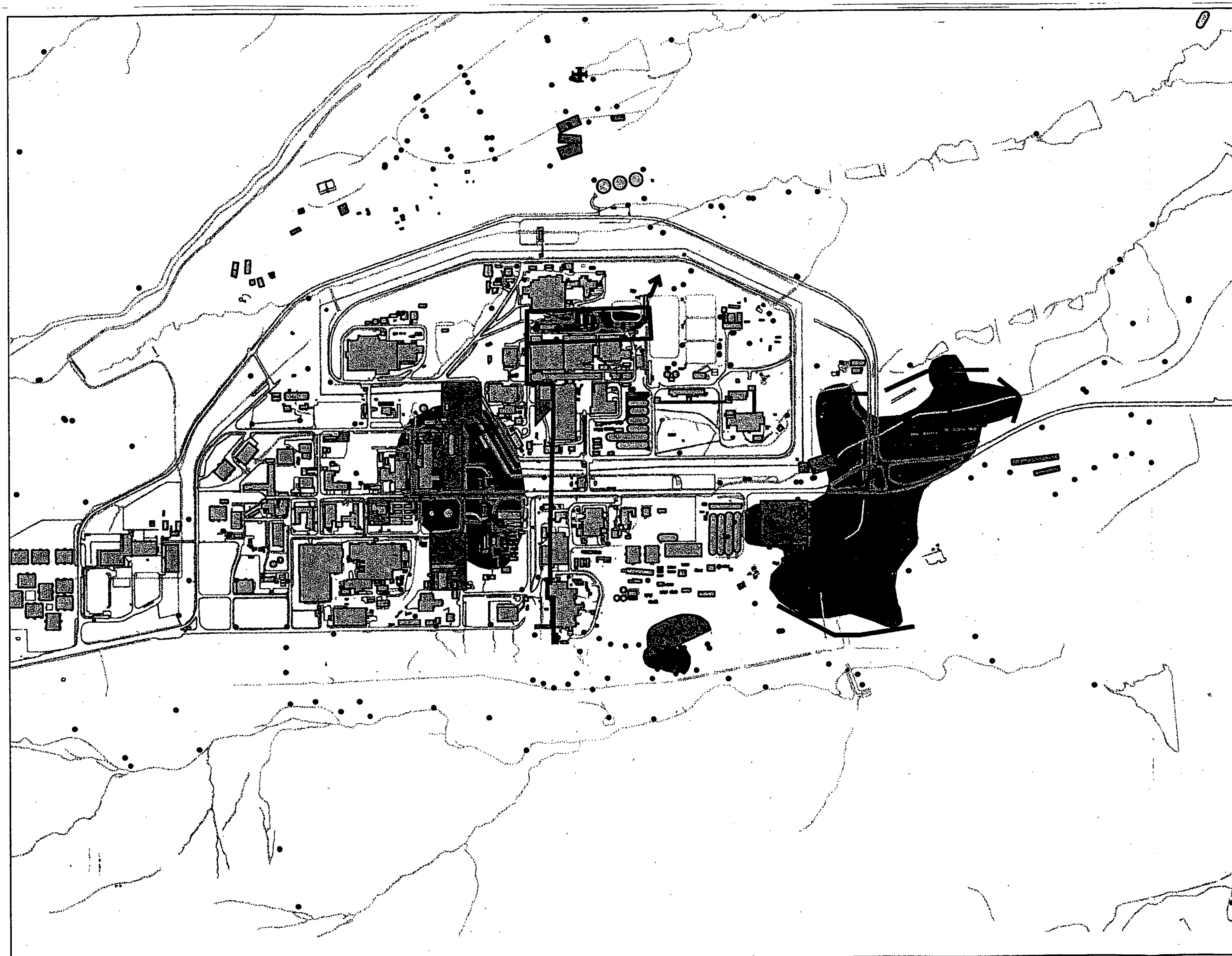
500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

MAP ID: a512660 February 13, 1996

/home/a512660/projects/kaiser-hill/alt4.aml



Possible Remediation Installations

Proposed Groundwater Management System Alternative 4: Mothball

Contamination extent boundaries represent groundwater sampling results for TCE, PCE, CCl4, and VC.

Figure D-12

LEGEND

- OU 7 Remediation Installation
- General Groundwater Flow Direction
- Remediation Installations
- Containment Wall
- Drain System
- Flow Control Wall
- Flow Through Treatment Wall
- Well With Contam. > 100 X MCL's
- UHSU Wells
- Buildings
- Suspected VOA Source
- Pavement
- Surface Drainage
- Concentrations > 100 X MCL's

Dimensions for remedial installations are approximate and not to scale

N

400 0 400 800 Feet

Table D-1 Alternative 1, Unrestricted

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
109	Trench T-2	High	Completed	
101	Solar Ponds	High	41,500	Excavate, final disposal
108	Trench T-1	High	9,500	Excavate, thermal desorption, final disposal
110	Trench T-3	High	65,600	Excavate, thermal desorption, final disposal
111.1	Trench T-4	High	88,600	Excavate, thermal desorption, final disposal
111.2	Trench T-5	High	49,200	Excavate, thermal desorption, final disposal
111.3	Trench T-6	High	16,400	Excavate, thermal desorption, final disposal
111.4	Trench T-7	High	23,000	Excavate, thermal desorption, final disposal
111.5	Trench T-8	High	23,000	Excavate, thermal desorption, final disposal
111.6	Trench T-9	High	23,000	Excavate, thermal desorption, final disposal
111.7	Trench T-10	High	16,400	Excavate, thermal desorption, final disposal
111.8	Trench T-11	High	23,000	Excavate, thermal desorption, final disposal
112	903 Pad	High	21,100	Excavate, thermal desorption, final disposal
113	Mound	High	13,700	Excavate, thermal desorption, final disposal
114	Present Landfill	High	a	Excavate, final disposal
115	Original Landfill	High	a	Excavate, final disposal
116.1	447 West Loading Dock	High	100	Excavate, final disposal
116.2	444 South Loading Dock	High	100	Excavate, thermal desorption, final disposal
117.1	North Site/Scrap Metal	High	1,000	Excavate, thermal desorption, final disposal
117.2	Middle Site Chemical Storage	High	12,300	Excavate, thermal desorption, final disposal
117.3	South Site Chemical Storage	High	700	Excavate, thermal desorption, final disposal
118.1	Solvent Spills West of 730	High	1,500	Excavate, thermal desorption, final disposal
118.2	Building 776 Solvent Spill	High	200	Excavate, thermal desorption, final disposal
119.1	West Scrap Metal Storage Area	High	10,600	Excavate, thermal desorption, final disposal
120.1	North Fiberglassing Area	High	100	Excavate, thermal desorption, final disposal
120.2	West Fiberglassing Area	High	900	Excavate, thermal desorption, final disposal
121	OWPL Pipelines and Tanks	High	101,400	Excavate, thermal desorption, final disposal
122	Underground Concrete Tank	High	200	Excavate, thermal desorption, final disposal
123.1	Valve Vault 7	High	b	Excavate, thermal desorption, final disposal
123.2	Valve Vault - 707	High	b	Excavate, thermal desorption, final disposal
124.1	Holding Tank No. 68	High	b	Excavate, thermal desorption, final disposal
124.2	Holding Tank No. 66	High	b	Excavate, thermal desorption, final disposal
124.3	Holding Tank No. 67	High	b	Excavate, thermal desorption, final disposal
125	Tank 66	High	b	Excavate, thermal desorption, final disposal
126.1	Process Waste Tanks	High	b	Excavate, thermal desorption, final disposal
126.2	Process Waste Tanks	High	b	Excavate, thermal desorption, final disposal
127.1	Low Level Rad Waste Leak	High	b	Excavate, thermal desorption, final disposal
127.2	Low Level Rad Waste Leak	High	b	Excavate, thermal desorption, final disposal
128	Oil Burn Pit No. 1	High	200	Excavate, thermal desorption, final disposal
129	Oil Leak	High	1,700	Excavate, thermal desorption, final disposal
131	Rad Site No. 1 - 700 Area	High	300	Excavate, thermal desorption, final disposal
132	Rad Site No. 4700 Area	High	b	Excavate, thermal desorption, final disposal
134.1	Rad Metal Site - North	High	2,300	Excavate, thermal desorption, final disposal
134.2	Rad Metal Site - South	High	2,400	Excavate, thermal desorption, final disposal
136.1	Cooling Tower Pond	High	100	Excavate, thermal desorption, final disposal
136.2	Cooling Tower Pond	High	100	Excavate, final disposal
137	712/713 Cooling Tower	High	2,000	Excavate, thermal desorption, final disposal
138	779 Cooling Tower	High	400	Excavate, thermal desorption, final disposal
139.1	Koh, Naoh, Condensate Tanks	High	100	Excavate, final disposal
139.2	Hydrofluoric Tank	High	30	Excavate, thermal desorption, final disposal
140	Hazardous Disposal Site	High	10,600	Excavate, thermal desorption, final disposal
142.1	Pond A-1	High	2,000	Excavate, final disposal

Table D-1 (Continued)

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
142.2	Pond A-2	High	1,800	Excavate, final disposal
142.3	Pond A-3	High	7,200	Excavate, final disposal
142.5	Pond B-1	High	2,000	Excavate, final disposal
142.6	Pond B-2	High	1,300	Excavate, final disposal
142.7	Pond B-3	High	1,000	Excavate, final disposal
142.8	Pond B-4	High	900	Excavate, final disposal
143	771 Outfall	High	c	Excavate, final disposal
144	Sewer Line Overflow	High	200	Excavate, thermal desorption, final disposal
146.1	Process Waste Tank No. 31	High	b	Excavate, thermal desorption, final disposal
146.2	Process Waste Tank No. 32	High	b	Excavate, thermal desorption, final disposal
146.3	Process Waste Tank No. 34 West	High	b	Excavate, thermal desorption, final disposal
146.4	Process Waste Tank No. 34 East	High	b	Excavate, thermal desorption, final disposal
146.5	Process Waste Tank No. 30	High	b	Excavate, thermal desorption, final disposal
146.6	Process Waste Tank No. 33	High	b	Excavate, thermal desorption, final disposal
147.1	Maas Area	High	b	Excavate, thermal desorption, final disposal
147.2	881 Conversion (Owen)	High	1,100	Excavate, final disposal
148	Waste Leaks	High	2,800	Excavate, thermal desorption, final disposal
149.1	OPWL to SEPS	High	b	Excavate, thermal desorption, final disposal
149.2	OPWL to SEPS	High	b	Excavate, thermal desorption, final disposal
150.1	Rad Site North of 771	High	300	Excavate, thermal desorption, final disposal
150.2	Rad Site North of 771/776	High	d	Excavate, final disposal
150.3	Rad Site Between 771/774	High	600	Excavate, thermal desorption, final disposal
150.4	Rad Site Northwest of 750	High	d	Excavate, final disposal
150.5	Rad Site West of 707	High	d	Excavate, thermal desorption, final disposal
150.6	Rad Site South of 779	High	3,100	Excavate, final disposal
150.7	Rad Site South of 776	High	d	Excavate, final disposal
150.8	Rad Site Northeast of 779	High	d	Excavate, final disposal
151	Fuel Oil Spills	High	500	Excavate, final disposal
152	Tank 221 Spills	High	500	Excavate, thermal desorption, final disposal
153	Oil Burn Pit No. 2	High	2,100	Excavate, thermal desorption, final disposal
154	Pallet Burn Site	High	e	Excavate, thermal desorption, final disposal
155	Lip Area (Americium Area)	High	29,600	Excavate, final disposal
156.1	334 Parking Lot	High	8,500	Excavate, final disposal
157.1	Rad Site North	High	3,200	Excavate, thermal desorption, final disposal
157.2	Rad Site South	High	1,100	Excavate, final disposal
158	Rad Site - 551	High	3,200	Excavate, thermal desorption, final disposal
159	Rad Site - 559	High	b	Excavate, thermal desorption, final disposal
160	Rad Site - 444 Parking Lot	High	100	Excavate, thermal desorption, final disposal
161	Rad Site, West of 664	High	300	Excavate, final disposal
162	Rad Site No. 2,700 Area	High	9,900	Excavate, thermal desorption, final disposal
163.1	Pad Site 700 Area 3	High	20	Excavate, thermal desorption, final disposal
163.2	Americium Slab	High	f	Excavate, final disposal
164.1	Rad Site - Concrete Slab	High	100	Excavate, thermal desorption, final disposal
164.2	Rad Site - 886 Spills	High	4,100	Excavate, thermal desorption, final disposal
164.3	Rad Site - 887 Pad	High	1,700	Excavate, final disposal
167.2	Landfill Pond Spray Area	High	a	Excavate, final disposal
170	PU&D Yard	High	19,100	Excavate, thermal desorption, final disposal
171	Fire Training	High	g	Excavate, thermal desorption, final disposal
172	Central Avenue Waste Spill	High	200	Excavate, final disposal
173	South Dock 991	High	200	Excavate, thermal desorption, final disposal
174.1	PU&D Storage Areas	High	17,100	Excavate, thermal desorption, final disposal
174.2	PU&D Storage Areas	High	100	Excavate, thermal desorption, final disposal

Table D-1 (Continued)

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
176	S&W Yard	High	28,200	Excavate, thermal desorption, final disposal
177	885 Drum Storage Area	High	2,600	Excavate, thermal desorption, final disposal
182	444/453 Storage Area	High	1,700	Excavate, final disposal
183	Gas Detox	High	1,100	Excavate, final disposal
186	VV 11, 12, 13	High	300	Excavate, thermal desorption, final disposal
187	Sulfuric Acid Spill	High	20	Excavate, final disposal
189	Nitric Acid Tanks	High	300	Excavate, final disposal
191	Hydrogen Peroxide Leak	High	40	Excavate, final disposal
197	Scrap Metal	High	200	Excavate, thermal desorption, final disposal
213	904 Pad	High	2,500	Excavate, final disposal
214	750 Pad	High	2,500	Excavate, final disposal
215	T-40 Tank 771	High	b	Excavate, thermal desorption, final disposal
102	Oil Sludge Pit	Low	0	
103	Chemical Burial	Low	0	
104	Liquid Dumping	Low	0	
105.1	Out-of-Service Fuel Tank	Low	0	
105.2	Out-of-Service Fuel Tank	Low	0	
106	Outfall	Low	0	
107	Building 881 Hillside Oil Leak	Low	0	
119.2	East Scrap Metal Storage Area	Low	0	
130	Contaminated Soil Disposal Area	Low	0	
133.1	Ash Pit No. 1	Low	0	
133.2	Ash Pit No. 2	Low	0	
133.3	Ash Pit No. 3	Low	0	
133.4	Ash Pit No. 4	Low	0	
133.5	Incinerator	Low	0	
133.6	Concrete Wash Pad	Low	0	
135	334 Cooling Tower	Low	0	
141	Sludge Dispersal Area	Low	0	
142.10	Pond C-1	Low	0	
142.11	Pond C-2	Low	0	
142.12	Pond A-5 (Flume Pond)	Low	0	
142.4	Pond A-4	Low	0	
142.9	Pond B-5	Low	0	
145	Sanitary Waste Line Leak	Low	0	
156.2	Soil Disposal Area	Low	0	
165	Triangle Area	Low	0	
166.1	Landfill Trench A	Low	0	
166.2	Landfill Trench B	Low	0	
166.3	Landfill Trench C	Low	0	
167.1	North Landfill Spray Area	Low	0	
167.3	Landfill South Spray Area	Low	0	
169	Hydrogen Peroxide	Low	0	
175	Contractor Storage Facility	Low	0	
181	334 Cargo Contaminated Area	Low	0	
184	991 Steam Cleaning Area	Low	0	
188	Acid Leak	Low	0	
190	Caustic Leak	Low	0	
196	Backwash Pond	Low	0	
199	Land Surface	Low	0	
200	Great Western	Low	0	
201	Standley Lake	Low	0	

Table D-1 (Continued)

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
202	Mower Reservoir	Low	0	
203	Inactive Hazardous Waste Storage	Low	0	
205	460 Sump 3-Acid	Low	0	
206	Inactive Tank D-836	Low	0	
207	444 Acid Dumpster	Low	0	
208	944/447 Waste Storage Area	Low	0	
209	Surface Disturbance	Low	0	
210	980 Cargo Contamination	Low	0	
216.1	East Spray Field	Low	0	
216.2	East Spray Fields - Center	Low	0	
216.3	East Spray Fields - South	Low	0	
PAC	Assumed (40%)	High	1,500	
UBC	Assumed (40%)	High	120,300	
	Contingency		45,000	
		Total Volume (m^3)	895,000	

a. Included in landfill subtask
b. Included in IHSS 121
c. Included in IHSS 172 and 126
d. Included in IHSS 150.6
e. Included in IHSS 153
f. Included in IHSS 150.1
g. Included in IHSS 134.1 and 134.2

Table D-2 Summary of Alternative 1, Unrestricted

Identification	Description	Total Volume (m³)	Total Cost	O&M Cost
IHSS				
101	High[2]	41,500	12,371,500	
102	Low[3]	0	20,000	
103	Low[3]	0	20,000	
104	Low[3]	0	20,000	
105.1	Low[3]	0	20,000	
105.2	Low[3]	0	20,000	
106	Low[3]	0	20,000	
107	Low[3]	0	20,000	
108	High[1]	9,500	4,793,500	
109	Completed	0	0	
110	High[1]	65,600	32,338,600	
111.1	High[1]	88,600	43,631,600	
111.2	High[1]	49,200	24,286,200	
111.3	High[1]	16,400	8,181,400	
111.4	High[1]	23,000	11,422,000	
111.5	High[1]	23,000	11,422,000	
111.6	High[1]	23,000	11,422,000	
111.7	High[1]	16,400	8,181,400	
111.8	High[1]	23,000	11,422,000	
112	High[1]	21,100	10,489,100	
113	High[1]	13,700	6,855,700	
114	High[2]	a	0	
115	High[2]	a	0	
116.1	High[2]	100	158,500	
116.2	High[1]	100	178,100	
117.1	High[1]	1,000	620,000	
117.2	High[1]	12,300	6,168,300	
117.3	High[1]	700	472,700	
118.1	High[1]	1,500	865,500	
118.2	High[1]	200	227,200	
119.1	High[1]	10,600	5,333,600	
119.2	Low[3]	0	20,000	
120.1	High[1]	100	178,100	
120.2	High[1]	900	570,900	
121-Pipelines	High[2]	101,400	49,916,400	
121-Tanks	High[1]	**	0	
122	High[1]	200	98,200	
123.1	High[1]	b	0	
123.2	High[1]	b	0	
124.1	High[1]	b	0	
124.2	High[1]	b	0	
124.3	High[1]	b	0	
125	High[1]	b	0	
126.1	High[1]	b	0	
126.2	High[1]	b	0	
127.1	High[1]	b	0	
127.2	High[1]	b	0	
128	High[1]	200	98,200	
129	High[1]	1,700	963,700	
130	Low[3]	0	20,000	
131	High[1]	300	276,300	
132	High[1]	b	0	
133.1	Low[3]	0	20,000	
133.2	Low[3]	0	20,000	
133.3	Low[3]	0	20,000	
133.4	Low[3]	0	20,000	
133.5	Low[3]	0	20,000	

Table D-2 (Continued)

Identification	Description	Total Volume (m^3)	Total Cost	O&M Cost
IHSS				
133.6	Low[3]	0	20,000	
134.1	High[1]	2,300	1,258,300	
134.2	High[1]	2,400	1,307,400	
135	Low[3]	0	20,000	
136.1	High[1]	100	178,100	
136.2	High[2]	100	158,500	
137	High[1]	2,000	1,111,000	
138	High[1]	400	325,400	
139.1	High[2]	100	158,500	
139.2	High[1]	30	14,700	
140	High[1]	10,600	5,333,600	
141	Low[3]	0	20,000	
142.10	Low[3]	0	20,000	
142.1	High[2]	2,000	719,000	
142.11	Low[3]	0	20,000	
142.12	Low[3]	0	20,000	
142.2	High[2]	1,800	660,000	
142.3	High[2]	7,200	2,253,000	
142.4	Low[3]	0	20,000	
142.5	High[2]	2,000	719,000	
142.6	High[2]	1,300	512,500	
142.7	High[2]	1,000	424,000	
142.8	High[2]	900	394,500	
142.9	Low[3]	0	20,000	
143	High[2]	c	0	
144	High[1]	200	227,200	
145	Low[3]	0	20,000	
146.1	High[1]	b	0	
146.2	High[1]	b	0	
146.3	High[1]	b	0	
146.4	High[1]	b	0	
146.5	High[1]	b	0	
146.6	High[1]	b	0	
147.1	High[1]	b	0	
147.2	High[2]	1,100	453,500	
148	High[1]	2,800	1,503,800	
149.1	High[1]	b	0	
149.2	High[1]	b	0	
150.1	High[1]	300	276,300	
150.2	High[2]	d	0	
150.3	High[1]	600	423,600	
150.4	High[2]	d	0	
150.5	High[1]	d	0	
150.6	High[2]	3,100	1,043,500	
150.7	High[2]	d	0	
150.8	High[2]	d	0	
151	High[2]	500	245,500	
152	High[1]	500	374,500	
153	High[1]	2,100	1,160,100	
154	High[1]	e	0	
155	High[2]	29,600	8,861,000	
156.1	High[2]	8,500	2,636,500	
156.2	Low[3]	0	20,000	
157.1	High[1]	3,200	1,700,200	
157.2	High[2]	1,100	453,500	
158	High[1]	3,200	1,700,200	
159	High[1]	b	0	
160	High[1]	100	178,100	

Table D-2 (Continued)

Identification	Description	Total Volume (m³)	Total Cost	O&M Cost
IHSS				
161	High[2]	300	217,500	
162	High[1]	9,900	4,989,900	
163.1	High[1]	20	9,800	
163.2	High[2]	f	0	
164.1	High[1]	100	178,100	
164.2	High[1]	4,100	2,142,100	
164.3	High[2]	1,700	630,500	
165	Low[3]	0	20,000	
166.1	Low[3]	0	20,000	
166.2	Low[3]	0	20,000	
166.3	Low[3]	0	20,000	
167.1	Low[3]	0	20,000	
167.2	High[2]	a	0	
167.3	Low[3]	0	20,000	
169	High[1]	0	0	
170	High[1]	19,100	9,507,100	
171	High[1]	g	0	
172	High[2]	200	188,000	
173	High[1]	200	227,200	
174.1	High[1]	17,100	8,525,100	
174.2	High[1]	100	178,100	
175	Low[3]	0	20,000	
176	High[1]	28,200	13,975,200	
177	High[1]	2,600	1,405,600	
181	Low[3]	0	20,000	
182	High[2]	1,700	630,500	
183	High[2]	1,100	453,500	
184	Low[3]	0	20,000	
186	High[1]	300	276,300	
187	High[2]	20	134,900	
188	Low[3]	0	20,000	
189	High[2]	300	217,500	
190	Low[3]	0	20,000	
191	High[2]	40	140,800	
196	Low[3]	0	20,000	
197	High[1]	200	227,200	
199	Low[3]	0	20,000	
200	Low[3]	0	20,000	
201	Low[3]	0	20,000	
202	Low[3]	0	20,000	
203	Low[3]	0	20,000	
205	Low[3]	0	20,000	
206	Low[3]	0	20,000	
207	Low[3]	0	20,000	
208	Low[3]	0	20,000	
209	Low[3]	0	20,000	
210	Low[3]	0	20,000	
213	High[2]	2,500	1,227,500	
214	High[2]	2,500	1,227,500	
215	High[1]	b	0	
216.1	Low[3]	0	20,000	
216.2	Low[3]	0	20,000	
216.3	Low[3]	0	20,000	
PAC	High[1]	1,500	865,500	
UBC	High[1]	120,300	59,196,300	
Contingency	High[1]	45,000	22,095,000	
	Subtotal	**895,000m³**	**$430,000,000**	-

Table D-2 (Continued)

Identification	Description	Total Volume (m³)	Total Cost	O&M Cost
Windblown Pu Contaminated Area	Excavate, Dispose Offsite*	850.000m³	$ 251,000,000	-
Landfills				
OU7	Excavate, Dispose Offsite*	310.000m³	15,000,000	-
OU5	Excavate, Dispose Offsite*	70.000m³	4,000,000	-
		380.000m³	$19,000,000	$ -
Groundwater	Barrier wall for Industrial Area, Groundwater Management, for OU 2, IHSS 118.1, and OU 7 Groundwater plumes		$24,000,000	$ 2,900,000
Surface Water	Convert to flow through system during remediation, convert to wetlands after		$4,000,000	***
Final Cover	N/A			
Overall Environmental Monitoring	During remediation and decomissioning activities			$ 11,900,000
	Post intermediate closure			$ -
	Final			$ 640,000
TOTALS	Capital	2.125.000m³	$728,000,000	
Total O&M Costs	During remediation		During remediation	$ 11,900,000
	Post intermediate closure		Post intermediate closure	$ -
	Final		Final	$ 3,500,000

* Assume WM covers disposal cost
** Included in above figure
*** Included in overall Environmental Monitoring Cost

Description Notes:
1. Excavate, thermal desorption, final disposal
2. Excavate, final disposal
3. Implement NA/NFA Decision Document

Total Volume Notes
a. Included in landfill subtask
b. Included in IHSS 121
c. Included in IHSS 172 and 126
d. Included in IHSS 160.6
e. Included in IHSS 153
f. Included in IHSS 150.1
g. Included in IHSS 134.1 and 134.2

Table D-3 Alternative 3, Retrievable, Monitored Storage and Disposal

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
109	Trench T-2	Completed	0	-
101	Solar Ponds	Low	0	
102	Oil Sludge Pit	Low	0	
103	Chemical Burial	Low	0	
104	Liquid Dumping	Low	0	
105.1	Out-of-Service Fuel Tank	Low	0	
105.2	Out-of-Service Fuel Tank	Low	0	
106	Outfall	Low	0	
107	Building 881 Hillside Oil Leak	Low	0	
108	Trench T-1	High	2,300	Excavate, thermal desorption, final disposal
110	Trench T-3	High	1,400	Excavate, thermal desorption, final disposal
111.1	Trench T-4	High	1,300	Excavate, thermal desorption, final disposal
111.2	Trench T-5	High	700	Excavate, thermal desorption, final disposal
111.3	Trench T-6	High	700	Excavate, thermal desorption, final disposal
111.4	Trench T-7	High	700	Excavate, thermal desorption, final disposal
111.5	Trench T-8	High	700	Excavate, thermal desorption, final disposal
111.6	Trench T-9	High	700	Excavate, thermal desorption, final disposal
111.7	Trench T-10	High	700	Excavate, thermal desorption, final disposal
111.8	Trench T-11	High	700	Excavate, thermal desorption, final disposal
112	903 Pad	High	7,600	Excavate, thermal desorption, final disposal
113	Mound	High	2,700	Excavate, thermal desorption, final disposal
116.1	447 West Loading Dock	Low	0	
116.2	444 South Loading Dock	Low	0	
117.1	North Site/Scrap Metal	Low	0	
117.2	Middle Site Chemical Storage	Low	0	
117.3	South Site Chemical Storage	Low	0	
118.1	Solvent Spills West of 730	High	1,500	Excavate, thermal desorption, final disposal
118.2	Building 776 Solvent Spill	High	30	Excavate, thermal desorption, final disposal
119.1	West Scrap Metal Storage Area	High	300	Excavate, thermal desorption, final disposal
119.2	East Scrap Metal Storage Area	Low	0	
120.1	North Fiberglassing Area	Low	0	
120.2	West Fiberglassing Area	Low	0	
121	Original Process Waste Line (OWPL)Tanks	High	1,000	Excavate, thermal desorption, final disposal
121	Original Process Waste Line (OWPL) Pipelines	High	23,100	Excavate, thermal desorption, final disposal
122	Underground Concrete Tank	High	100	Excavate, thermal desorption, final disposal
123.1	Valve Vault 7	Low	0	
123.2	Valve Vault - 707	High	a	Excavate, thermal desorption, final disposal
124.1	Holding Tank No. 68	High	b	Excavate, thermal desorption, final disposal
124.2	Holding Tank No. 66	High	b	Excavate, thermal desorption, final disposal
124.3	Holding Tank No. 67	High	3,400	Excavate, thermal desorption, final disposal
125	Tank 66	High	b	Excavate, thermal desorption, final disposal
126.1	Process Waste Tanks	High	5	Excavate, thermal desorption, final disposal
126.2	Process Waste Tanks	High	5	Excavate, thermal desorption, final disposal
127.1	Low Level Rad Waste Leak	High	a	Excavate, thermal desorption, final disposal
127.2	Low Level Rad Waste Leak	Low	0	
128	Oil Burn Pit No. 1	High	100	Excavate, thermal desorption, final disposal
129	Oil Leak	High	1,700	Excavate, thermal desorption, final disposal
130	Contaminated Soil Disposal Area	Low	0	
131	Rad Site No. 1 - 700 Area	High	200	Excavate, thermal desorption, final disposal
132	Rad Site No. 4700 Area	High	c	Excavate, thermal desorption, final disposal
133.1	Ash Pit No. 1	Low	0	
133.2	Ash Pit No. 2	Low	0	
133.3	Ash Pit No. 3	Low	0	
133.4	Ash Pit No. 4	Low	0	

Table D-3 (Continued)

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
133.5	Incinerator	Low	0	
133.6	Concrete Wash Pad	Low	0	
134.1	Rad Metal Site - North	High	d	Excavate, thermal desorption, final disposal
134.2	Rad Metal Site - South	Low	0	
135	334 Cooling Tower	Low	0	
136.1	Cooling Tower Pond	Low	0	
136.2	Cooling Tower Pond	Low	0	
137	712/713 Cooling Tower	High	30	Excavate, thermal desorption, final disposal
138	779 Cooling Tower	High	10	Excavate, thermal desorption, final disposal
139.1	Koh, Naoh, Condensate Tanks	Low	0	
139.2	Hydrofluoric Tank	Low	0	
140	Hazardous Disposal Site	High	800	Excavate, thermal desorption, final disposal
141	Sludge Dispersal Area	Low	0	
142.1	Pond A-1	Low	0	
142.10	Pond C-1	Low	0	
142.11	Pond C-2	Low	0	
142.12	Pond A-5 (Flume Pond)	Low	0	
142.2	Pond A-2	Low	0	
142.3	Pond A-3	Low	0	
142.4	Pond A-4	Low	0	
142.5	Pond B-1	Low	0	
142.6	Pond B-2	Low	0	
142.7	Pond B-3	Low	0	
142.8	Pond B-4	Low	0	
142.9	Pond B-5	Low	0	
143	771 Outfall	Low	0	
144	Sewer Line Overflow	High	c	Excavate, thermal desorption, final disposal
145	Sanitary Waste Line Leak	Low	0	
146.1	Process Waste Tank No. 31	High	e	Excavate, thermal desorption, final disposal
146.2	Process Waste Tank No. 32	High	e	Excavate, thermal desorption, final disposal
146.3	Process Waste Tank No. 34 West	High	e	Excavate, thermal desorption, final disposal
146.4	Process Waste Tank No. 34 East	High	e	Excavate, thermal desorption, final disposal
146.5	Process Waste Tank No. 30	High	e	Excavate, thermal desorption, final disposal
146.6	Process Waste Tank No. 33	High	e	Excavate, thermal desorption, final disposal
147.1	Maas Area	High	a	Excavate, thermal desorption, final disposal
147.2	881 Conversion (Owen)	Low	0	
148	Waste Leaks	Low	0	
149.1	OPWL to SEPS	High	a	Excavate, thermal desorption, final disposal
149.2	OPWL to SEPS	High	a	Excavate, thermal desorption, final disposal
150.1	Rad Site North of 771	Low	0	
150.2	Rad Site North of 771/776	Low	0	
150.3	Rad Site Between 771/774	Low	0	
150.4	Rad Site Northwest of 750	Low	0	
150.5	Rad Site West of 707	High	a	Excavate, thermal desorption, final disposal
150.6	Rad Site South of 779	High	5	Excavate, final disposal
150.7	Rad Site South of 776	Low	0	
150.8	Rad Site Northeast of 779	High	f	Excavate, final disposal
151	Fuel Oil Spills	Low	0	
152	Tank 221 Spills	Low	0	
153	Oil Bum Pit No. 2	High	1,100	Excavate, thermal desorption, final disposal
154	Pallet Bum Site	High	g	Excavate, thermal desorption, final disposal
155	Lip Area (Americium Area)	High	4,200	Excavate, final disposal
156.1	334 Parking Lot	Low	0	
156.2	Soil Disposal Area	Low	0	

Table D-3 (Continued)

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
157.1	Rad Site North	Low	0	
157.2	Rad Site South	Low	0	
158	Rad Site - 551	Low	0	
160	Rad Site - 444 Parking Lot	Low	0	
161	Rad Site, West of 664	Low	0	
162	Rad Site No. 2,700 Area	Low	0	
163.1	Pad Site 700 Area 3	Low	0	
163.2	Americium Slab	Low	0	
164.1	Rad Site - Concrete Slab	Low	0	
164.2	Rad Site - 886 Spills	Low	0	
164.3	Rad Site - 887 Pad	Low	0	
165	Triangle Area	Low	0	
166.1	Landfill Trench A	Low	0	
166.2	Landfill Trench B	Low	0	
166.3	Landfill Trench C	Low	0	
167.1	North Landfill Spray Area	Low	0	
167.3	Landfill South Spray Area	Low	0	
169	Hydrogen Peroxide	Low	0	
171	Fire Training	High	d	Excavate, thermal desorption, final disposal
172	Central Avenue Waste Spill	Low	0	
173	South Dock 991	Low	0	
174.1	PU&D Storage Areas	High	17,100	Excavate, thermal desorption, final disposal
175	Contractor Storage Facility	Low	0	
176	S&W Yard	High	100	Excavate, thermal desorption, final disposal
177	885 Drum Storage Area	Low	0	
181	334 Cargo Contaminated Area	Low	0	
182	444/453 Storage Area	Low	0	
183	Gas Detox	High	400	Excavate, final disposal
184	991 Steam Cleaning Area	Low	0	
186	VV 11, 12, 13	Low	0	
187	Sulfuric Acid Spill	Low	0	
188	Acid Leak	Low	0	
189	Nitric Acid Tanks	Low	0	
190	Caustic Leak	Low	0	
191	Hydrogen Peroxide Leak	Low	0	
196	Backwash Pond	Low	0	
197	Scrap Metal	Low	0	
199	Land Surface	Low	0	
200	Great Western	Low	0	
201	Standley Lake	Low	0	
202	Mower Reservoir	Low	0	
203	Inactive Hazardous Waste Storage	Low	0	
205	460 Sump 3-Acid	Low	0	
206	Inactive Tank D-836	Low	0	
207	444 Acid Dumpster	Low	0	
208	944/447 Waste Storage Area	Low	0	
209	Surface Disturbance	Low	0	
210	980 Cargo Contamination	Low	0	
213	904 Pad	Low	0	
214	750 Pad	Low	0	
215	T-40 Tank 771	Low	0	
216.1	East Spray Field	Low	0	
216.2	East Spray Fields - Center	Low	0	
216.3	East Spray Fields - South	Low	0	

Table D-3 (Continued)

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
159	Rad Site - 559	High	h	Excavate, thermal desorption, final disposal
170	PU&D Yard	High	i	Excavate, thermal desorption, final disposal
174.2	PU&D Storage Areas	High	i	Excavate, thermal desorption, final disposal
114	Present Landfill	Low	j	
115	Original Landfill	Low	j	
167.2	Landfill Pond Spray Area	Low	j	
PAC	Assumed (20%)	High	500	
UBC	Assumed (20%)	High	60,200	
	Contingency		45,000	
		Total Volume (m^3)	180,000	

a. Included in IHSS 121 pipeline
b. Included in IHSS 124.3
c. Included in IHSS 118.1
d. Included in IHSS 128
e. Included in UBC B774
f. Included in IHSS 150.6
g. Included in IHSS 153
h. Included in UBC B559
i. Included in IHSS 174.1
j. Included in landfill subtask

Table D-4 Summary of Alternative 3, Retrievable, Monitored Storage and Disposal

Identification	Description	Total Volume (m^3)	Total Costs	O&M Cost
IHSS				
101	Low[3]	0	20,000	
102	Low[3]	0	20,000	
103	Low[3]	0	20,000	
104	Low[3]	0	20,000	
105.1	Low[3]	0	20,000	
105.2	Low[3]	0	20,000	
106	Low[3]	0	20,000	
107	Low[3]	0	20,000	
108	High[1]	2,300	1,258,300	
109	Completed	0	0	
110	High[1]	1,400	816,400	
111.1	High[1]	1,300	767,300	
111.2	High[1]	700	472,700	
111.3	High[1]	700	472,700	
111.4	High[1]	700	472,700	
111.5	High[1]	700	472,700	
111.6	High[1]	700	472,700	
111.7	High[1]	700	472,700	
111.8	High[1]	700	472,700	
112	High[1]	7,600	3,860,600	
113	High[1]	2,700	1,454,700	
114	Low[3]	i	20,000	
115	Low[3]	i	20,000	
116.1	Low[3]	0	20,000	
116.2	Low[3]	0	20,000	
117.1	Low[3]	0	20,000	
117.2	Low[3]	0	20,000	
117.3	Low[3]	0	20,000	
118.1	High[1]	1,500	865,500	
118.2	High[1]	30	143,730	
119.1	High[1]	300	276,300	
119.2	Low[3]	0	20,000	
120.1	Low[3]	0	20,000	
120.2	Low[3]	0	20,000	
121-Pipelines	High[1]	23,100	11,471,100	
121-Tanks	High[1]	1,000	620,000	
122	High[1]	100	178,100	
123.1	Low[3]	0	20,000	
123.2	High[1]	a	0	
124.1	High[1]	b	0	
124.2	High[1]	b	0	
124.3	High[1]	3,400	1,798,400	
125	High[1]	b	0	
126.1	High[1]	5	131,455	
126.2	High[1]	5	131,455	
127.1	High[1]	a	0	
127.2	Low[3]	0	20,000	
128	High[1]	100	178,100	
129	High[1]	1,700	963,700	
130	Low[3]	0	20,000	
131	High[1]	200	227,200	
132	High[1]	c	0	
133.1	Low[3]	0	20,000	
133.2	Low[3]	0	20,000	
133.3	Low[3]	0	20,000	
133.4	Low[3]	0	20,000	
133.5	Low[3]	0	20,000	

Table D-4 (Continued)

Identification	Description	Total Volume (m³)	Total Costs	O&M Cost
IHSS				
133.6	Low[3]	0	20,000	
134.1	High[1]	d	0	
134.2	Low[3]	0	20,000	
135	Low[3]	0	20,000	
136.1	Low[3]	0	20,000	
136.2	Low[3]	0	20,000	
137	High[1]	30	143,730	
138	High[1]	10	133,910	
139.1	Low[3]	0	20,000	
139.2	Low[3]	0	20,000	
140	High[1]	800	521,800	
141	Low[3]	0	20,000	
142.1	Low[3]	0	20,000	
142.10	Low[3]	0	20,000	
142.11	Low[3]	0	20,000	
142.12	Low[3]	0	20,000	
142.2	Low[3]	0	20,000	
142.3	Low[3]	0	20,000	
142.4	Low[3]	0	20,000	
142.5	Low[3]	0	20,000	
142.6	Low[3]	0	20,000	
142.7	Low[3]	0	20,000	
142.8	Low[3]	0	20,000	
142.9	Low[3]	0	20,000	
143	Low[3]	0	20,000	
144	High[1]	c	0	
145	Low[3]	0	20,000	
146.1	High[1]	h	0	
146.2	High[1]	h	0	
146.3	High[1]	h	0	
146.4	High[1]	h	0	
146.5	High[1]	h	0	
146.6	High[1]	h	0	
147.1	High[1]	a	0	
147.2	Low[3]	0	20,000	
148	Low[3]	0	20,000	
149.1	High[1]	a	0	
149.2	High[1]	a	0	
150.1	Low[3]	0	20,000	
150.2	Low[3]	0	20,000	
150.3	Low[3]	0	20,000	
150.4	Low[3]	0	20,000	
150.5	High[1]	a	0	
150.6	High[2]	5	130,475	
150.7	Low[3]	0	20,000	
150.8	High[2]	e	0	
151	Low[3]	0	20,000	
152	Low[3]	0	20,000	
153	High[1]	1,100	669,100	
154	High[1]	f	0	
155	High[2]	4,200	1,368,000	
156.1	Low[3]	0	20,000	
156.2	Low[3]	0	20,000	
157.1	Low[3]	0	20,000	
157.2	Low[3]	0	20,000	
158	Low[3]	0	20,000	
159	High[1]	g	0	
160	Low[3]	0	20,000	

Table D-4 (Continued)

Identification	Description	Total Volume (m^3)	Total Costs	O&M Cost
IHSS				
161	Low[3]	0	20,000	
162	Low[3]	0	20,000	
163.1	Low[3]	0	20,000	
163.2	Low[3]	0	20,000	
164.1	Low[3]	0	20,000	
164.2	Low[3]	0	20,000	
164.3	Low[3]	0	20,000	
165	Low[3]	0	20,000	
166.1	Low[3]	0	20,000	
166.2	Low[3]	0	20,000	
166.3	Low[3]	0	20,000	
167.1	Low[3]	0	20,000	
167.2	Low[3]	i	20,000	
167.3	Low[3]	0	20,000	
169	Low[3]	0	20,000	
170	High[1]	j	0	
171	High[1]	d	0	
172	Low[3]	0	20,000	
173	Low[3]	0	20,000	
174.1	High[1]	17,100	8,525,100	
174.2	High[1]	j	0	
175	Low[3]	0	20,000	
176	High[1]	100	178,100	
177	Low[3]	0	20,000	
181	Low[3]	0	20,000	
182	Low[3]	0	20,000	
183	High[2]	400	247,000	
184	Low[3]	0	20,000	
186	Low[3]	0	20,000	
187	Low[3]	0	20,000	
188	Low[3]	0	20,000	
189	Low[3]	0	20,000	
190	Low[3]	0	20,000	
191	Low[3]	0	20,000	
196	Low[3]	0	20,000	
197	Low[3]	0	20,000	
199	Low[3]	0	20,000	
200	Low[3]	0	20,000	
201	Low[3]	0	20,000	
202	Low[3]	0	20,000	
203	Low[3]	0	20,000	
205	Low[3]	0	20,000	
206	Low[3]	0	20,000	
207	Low[3]	0	20,000	
208	Low[3]	0	20,000	
209	Low[3]	0	20,000	
210	Low[3]	0	20,000	
213	Low[3]	0	20,000	
214	Low[3]	0	20,000	
215	Low[3]	0	20,000	
216.1	Low[3]	0	20,000	
216.2	Low[3]	0	20,000	
216.3	Low[3]	0	20,000	
PAC	High[1]	500	374,500	
UBC	High[1]	60,200	29,687,200	
Contingency	High[1]	45,000	12,414,000	
	Subtotal	181,000m^3	$ 85,000,000	$ -

Table D-4 (Continued)

Identification	Description	Total Volume (m^3)		Total Costs		O&M Cost
Windblown Pu Contaminated Area	N/A					
Landfills						
OU7	Closure in place, RCRA Cap	-		7,910,000		52,000
OU5	Excavate, Dispose Onsite*	70.000m³		3,920,000		-
	Subtotal	70.000m³	$	12,000,000	$	52,000
Groundwater	Source removal with IHSS, groundwater management for OU 2, IHSS 118.1, and OU 7 groundwater plumes			$1,000,000	$	1,128,000
Surface Water	Convert to flow through system during remediation, convert to wetlands after			$5,000,000		***
Final Cover	Final cover over PA and 800 area			$119,000,000	$	1,000,000
Overall Environmental Monitoring	During remediation and decomissioning activities				$	11,900,000
	Post intermediate closure				$	2,770,000
	Final				$	2,090,000
TOTALS	Capital **Total**	251.000m³		$222,000,000		
Total O&M Costs	During remediation				$	11,900,000
	Post intermediate closure				$	4,900,000
	Final				$	4,200,000

* Assume WM covers disposal cost
** Included in above figure
*** Included in overall Environmental Monitoring Cost

Description Notes:
1. Excavate, thermal desorption, final disposal
2. Excavate, final disposal
3. Implement NA/NFA Decision Document

Total Volume Notes
a. Included in IHSS 121 pipeline
b. Included in IHSS 124.3
c. Included in IHSS 118.1
d. Included in IHSS 128
e. Included in UBC B559
f. Included in UBC B774
g. Included in IHSS 150.6
h. Included in IHSS 153
i. Included in landfill subtask
j. Included in IHSS 174.1

Table D-5 Alternative 4, Mothball

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
109	Trench T-2	Completed	0	-
101	Solar Ponds	Low	0	
102	Oil Sludge Pit	Low	0	
103	Chemical Burial	Low	0	
104	Liquid Dumping	Low	0	
105.1	Out-of-Service Fuel Tank	Low	0	
105.2	Out-of-Service Fuel Tank	Low	0	
106	Outfall	Low	0	
107	Building 881 Hillside Oil Leak	Low	0	
108	Trench T-1	High	2,300	Excavate, thermal desorption, final disposal
110	Trench T-3	High	1,400	Excavate, thermal desorption, final disposal
111.1	Trench T-4	High	1,300	Excavate, thermal desorption, final disposal
111.2	Trench T-5	High	700	Excavate, thermal desorption, final disposal
111.3	Trench T-6	High	700	Excavate, thermal desorption, final disposal
111.4	Trench T-7	High	700	Excavate, thermal desorption, final disposal
111.5	Trench T-8	High	700	Excavate, thermal desorption, final disposal
111.6	Trench T-9	High	700	Excavate, thermal desorption, final disposal
111.7	Trench T-10	High	700	Excavate, thermal desorption, final disposal
111.8	Trench T-11	High	700	Excavate, thermal desorption, final disposal
112	903 Pad	High	7,600	Excavate, thermal desorption, final disposal
113	Mound	High	2,700	Excavate, thermal desorption, final disposal
114	Present Landfill	Low	i	
115	Original Landfill	Low	i	
116.1	447 West Loading Dock	Low	0	
116.2	444 South Loading Dock	Low	0	
117.1	North Site/Scrap Metal	Low	0	
117.2	Middle Site Chemical Storage	Low	0	
117.3	South Site Chemical Storage	Low	0	
118.1	Solvent Spills West of 730	High	1,500	Excavate, thermal desorption, final disposal
118.2	Building 776 Solvent Spill	High	30	Excavate, thermal desorption, final disposal
119.1	West Scrap Metal Storage Area	High	300	Excavate, thermal desorption, final disposal
119.2	East Scrap Metal Storage Area	Low	0	
120.1	North Fiberglassing Area	Low	0	
120.2	West Fiberglassing Area	Low	0	
121	Original Process Waste Line (OWPL)Tanks	High	1,000	Excavate, thermal desorption, final disposal
121	Original Process Waste Line (OWPL) Pipelines	High	16,200	Excavate, thermal desorption, final disposal
122	Underground Concrete Tank	High	20	Excavate, thermal desorption, final disposal
123.1	Valve Vault 7	Low	0	
123.2	Valve Vault - 707	High	a	Excavate, thermal desorption, final disposal
124.1	Holding Tank No. 68	High	b	Excavate, thermal desorption, final disposal
124.2	Holding Tank No. 66	High	b	Excavate, thermal desorption, final disposal
124.3	Holding Tank No. 67	High	2,700	Excavate, thermal desorption, final disposal
125	Tank 66	High	b	Excavate, thermal desorption, final disposal
126.1	Process Waste Tanks	High	5	Excavate, thermal desorption, final disposal
126.2	Process Waste Tanks	High	5	Excavate, thermal desorption, final disposal
127.1	Low Level Rad Waste Leak	High	a	Excavate, thermal desorption, final disposal
127.2	Low Level Rad Waste Leak	Low	0	
128	Oil Bum Pit No. 1	High	100	Excavate, thermal desorption, final disposal
129	Oil Leak	High	1,700	Excavate, thermal desorption, final disposal
130	Contaminated Soil Disposal Area	Low	0	
131	Rad Site No. 1 - 700 Area	High	200	Excavate, thermal desorption, final disposal
132	Rad Site No. 4700 Area	High	c	Excavate, thermal desorption, final disposal
133.1	Ash Pit No. 1	Low	0	
133.2	Ash Pit No. 2	Low	0	

Table D-5 (Continued)

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
133.3	Ash Pit No. 3	Low	0	
133.4	Ash Pit No. 4	Low	0	
133.5	Incinerator	Low	0	
133.6	Concrete Wash Pad	Low	0	
134.1	Rad Metal Site - North	High	d	Excavate, thermal desorption, final disposal
134.2	Rad Metal Site - South	Low	0	
135	334 Cooling Tower	Low	0	
136.1	Cooling Tower Pond	Low	0	
136.2	Cooling Tower Pond	Low	0	
137	712/713 Cooling Tower	High	20	Excavate, thermal desorption, final disposal
138	779 Cooling Tower	High	10	Excavate, thermal desorption, final disposal
139.1	Koh, Naoh, Condensate Tanks	Low	0	
139.2	Hydrofluoric Tank	Low	0	
140	Hazardous Disposal Site	High	800	Excavate, thermal desorption, final disposal
141	Sludge Dispersal Area	Low	0	
142.1	Pond A-1	Low	0	
142.10	Pond C-1	Low	0	
142.11	Pond C-2	Low	0	
142.12	Pond A-5 (Flume Pond)	Low	0	
142.2	Pond A-2	Low	0	
142.3	Pond A-3	Low	0	
142.4	Pond A-4	Low	0	
142.5	Pond B-1	Low	0	
142.6	Pond B-2	Low	0	
142.7	Pond B-3	Low	0	
142.8	Pond B-4	Low	0	
142.9	Pond B-5	Low	0	
143	771 Outfall	Low	0	
144	Sewer Line Overflow	High	c	Excavate, thermal desorption, final disposal
145	Sanitary Waste Line Leak	Low	0	
146.1	Process Waste Tank No. 31	Cannot Access	0	
146.2	Process Waste Tank No. 32	Cannot Access	0	
146.3	Process Waste Tank No. 34 West	Cannot Access	0	
146.4	Process Waste Tank No. 34 East	Cannot Access	0	
146.5	Process Waste Tank No. 30	Cannot Access	0	
146.6	Process Waste Tank No. 33	Cannot Access	0	
147.1	Maas Area	High	a	Excavate, thermal desorption, final disposal
147.2	881 Conversion (Owen)	Low	0	
148	Waste Leaks	Low	0	
149.1	OPWL to SEPS	High	a	Excavate, thermal desorption, final disposal
149.2	OPWL to SEPS	High	a	Excavate, thermal desorption, final disposal
150.1	Rad Site North of 771	Low	0	
150.2	Rad Site North of 771/776	Low	0	
150.3	Rad Site Between 771/774	Low	0	
150.4	Rad Site Northwest of 750	Low	0	
150.5	Rad Site West of 707	High	a	Excavate, thermal desorption, final disposal
150.6	Rad Site South of 779	High	5	Excavate, final disposal
150.7	Rad Site South of 776	Low	0	
150.8	Rad Site Northeast of 779	High	e	Excavate, final disposal
151	Fuel Oil Spills	Low	0	
152	Tank 221 Spills	Low	0	
153	Oil Burn Pit No. 2	High	1,100	Excavate, thermal desorption, final disposal
154	Pallet Burn Site	High	f	Excavate, thermal desorption, final disposal
155	Lip Area (Americium Area)	High	4,200	Excavate, final disposal

Table D-5 (Continued)

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
156.1	334 Parking Lot	Low	0	
156.2	Soil Disposal Area	Low	0	
157.1	Rad Site North	Low	0	
157.2	Rad Site South	Low	0	
158	Rad Site - 551	Low	0	
159	Rad Site - 559	High	g	Excavate, thermal desorption, final disposal
160	Rad Site - 444 Parking Lot	Low	0	
161	Rad Site, West of 664	Low	0	
162	Rad Site No. 2,700 Area	Low	0	
163.1	Pad Site 700 Area 3	Low	0	
163.2	Americium Slab	Low	0	
164.1	Rad Site - Concrete Slab	Low	0	
164.2	Rad Site - 886 Spills	Low	0	
164.3	Rad Site - 887 Pad	Low	0	
165	Triangle Area	Low	0	
166.1	Landfill Trench A	Low	0	
166.2	Landfill Trench B	Low	0	
166.3	Landfill Trench C	Low	0	
167.1	North Landfill Spray Area	Low	0	
167.2	Landfill Pond Spray Area	Low	i	
167.3	Landfill South Spray Area	Low	0	
169	Hydrogen Peroxide	Low	0	
170	PU&D Yard	High	h	Excavate, thermal desorption, final disposal
171	Fire Training	High	d	Excavate, thermal desorption, final disposal
172	Central Avenue Waste Spill	Low	0	
173	South Dock 991	Low	0	
174.1	PU&D Storage Areas	High	17,100	Excavate, thermal desorption, final disposal
174.2	PU&D Storage Areas	High	h	Excavate; thermal desorption, final disposal
175	Contractor Storage Facility	Low	0	
176	S&W Yard	High	100	Excavate, thermal desorption, final disposal
177	885 Drum Storage Area	Low	0	
181	334 Cargo Contaminated Area	Low	0	
182	444/453 Storage Area	Low	0	
183	Gas Detox	High	400	Excavate, final disposal
184	991 Steam Cleaning Area	Low	0	
186	VV 11, 12, 13	Low	0	
187	Sulfuric Acid Spill	Low	0	
188	Acid Leak	Low	0	
189	Nitric Acid Tanks	Low	0	
190	Caustic Leak	Low	0	
191	Hydrogen Peroxide Leak	Low	0	
196	Backwash Pond	Low	0	
197	Scrap Metal	Low	0	
199	Land Surface	Low	0	
200	Great Western	Low	0	
201	Standley Lake	Low	0	
202	Mower Reservoir	Low	0	
203	Inactive Hazardous Waste Storage	Low	0	
205	460 Sump 3-Acid	Low	0	
206	Inactive Tank D-836	Low	0	
207	444 Acid Dumpster	Low	0	
208	944/447 Waste Storage Area	Low	0	
209	Surface Disturbance	Low	0	
210	980 Cargo Contamination	Low	0	

Table D-5 (Continued)

Identification	Description	Ranking	Total Volume (m^3)	Treatment Technology for High-Ranking Locations
IHSS				
213	904 Pad	Low	0	
214	750 Pad	Low	0	
215	T-40 Tank 771	Low	0	
216.1	East Spray Field	Low	0	
216.2	East Spray Fields - Center	Low	0	
216.3	East Spray Fields - South	Low	0	
PAC	Assumed (20%)	High	500	
UBC	Assumed (0%)	High	0	
	Contingency		45,000	
		Total Volume (m^3)	115,000	

a. Included in IHSS 121 pipeline
b. Included in IHSS 124.3
c. Included in IHSS 118.1
d. Included in IHSS 128
e. Included in UBC B559
f. Included in UBC B774
g. Included in IHSS 150.6
h. Included in IHSS 174.1
i. Included in landfill subtask

Table D-6 Summary of Alternative 4, Mothball

Identification	Description	Total Volume (m^3)	Total Costs	O&M Cost
IHSS				
101	Low[3]	0	20,000	
102	Low[3]	0	20,000	
103	Low[3]	0	20,000	
104	Low[3]	0	20,000	
105.1	Low[3]	0	20,000	
105.2	Low[3]	0	20,000	
106	Low[3]	0	20,000	
107	Low[3]	0	20,000	
108	High[1]	2,300	1,258,300	
109	Completed	0	0	
110	High[1]	1,400	816,400	
111.1	High[1]	1,300	767,300	
111.2	High[1]	700	472,700	
111.3	High[1]	700	472,700	
111.4	High[1]	700	472,700	
111.5	High[1]	700	472,700	
111.6	High[1]	700	472,700	
111.7	High[1]	700	472,700	
111.8	High[1]	700	472,700	
112	High[1]	7,600	3,860,600	
113	High[1]	2,700	1,454,700	
114	Low[3]	i	20,000	
115	Low[3]	i	20,000	
116.1	Low[3]	0	20,000	
116.2	Low[3]	0	20,000	
117.1	Low[3]	0	20,000	
117.2	Low[3]	0	20,000	
117.3	Low[3]	0	20,000	
118.1	High[1]	1,500	865,500	
118.2	High[1]	30	143,730	
119.1	High[1]	300	276,300	
119.2	Low[3]	0	20,000	
120.1	Low[3]	0	20,000	
120.2	Low[3]	0	20,000	
121-Pipelines	High[1]	16,200	8,083,200	
121-Tanks	High[1]	1,000	620,000	
122	High[1]	20	138,820	
123.1	Low[3]	0	20,000	
123.2	High[1]	a	0	
124.1	High[1]	b	0	
124.2	High[1]	b	0	
124.3	High[1]	2,700	1,454,700	
125	High[1]	b	0	
126.1	High[1]	5	131,455	
126.2	High[1]	5	131,455	
127.1	High[1]	a	0	
127.2	Low[3]	0	20,000	
128	High[1]	100	178,100	
129	High[1]	1,700	963,700	
130	Low[3]	0	20,000	
131	High[1]	200	227,200	
132	High[1]	c	0	
133.1	Low[3]	0	20,000	
133.2	Low[3]	0	20,000	
133.3	Low[3]	0	20,000	
133.4	Low[3]	0	20,000	
133.5	Low[3]	0	20,000	

Table D-6 (Continued)

Identification	Description	Total Volume (m^3)	Total Costs	O&M Cost
IHSS				
133.6	Low[3]	0	20,000	
134.1	High[1]	[d]	0	
134.2	Low[3]	0	20,000	
135	Low[3]	0	20,000	
136.1	Low[3]	0	20,000	
136.2	Low[3]	0	20,000	
137	High[1]	20	138,820	
138	High[1]	10	133,910	
139.1	Low[3]	0	20,000	
139.2	Low[3]	0	20,000	
140	High[1]	800	521,800	
141	Low[3]	0	20,000	
142.1	Low[3]	0	20,000	
142.10	Low[3]	0	20,000	
142.11	Low[3]	0	20,000	
142.12	Low[3]	0	20,000	
142.2	Low[3]	0	20,000	
142.3	Low[3]	0	20,000	
142.4	Low[3]	0	20,000	
142.5	Low[3]	0	20,000	
142.6	Low[3]	0	20,000	
142.7	Low[3]	0	20,000	
142.8	Low[3]	0	20,000	
142.9	Low[3]	0	20,000	
143	Low[3]	0	20,000	
144	High[1]	[c]	0	
145	Low[3]	0	20,000	
146.1	Low[3]	[h]	20,000	
146.2	Low[3]	[h]	20,000	
146.3	Low[3]	[h]	20,000	
146.4	Low[3]	[h]	20,000	
146.5	Low[3]	[h]	20,000	
146.6	Low[3]	[h]	20,000	
147.1	High[1]	[a]	0	
147.2	Low[3]	0	20,000	
148	Low[3]	0	20,000	
149.1	High[1]	[a]	0	
149.2	High[1]	[a]	0	
150.1	Low[3]	0	20,000	
150.2	Low[3]	0	20,000	
150.3	Low[3]	0	20,000	
150.4	Low[3]	0	20,000	
150.5	High[1]	[a]	0	
150.6	High[2]	5	130,475	
150.7	Low[3]	0	20,000	
150.8	High[2]	[e]	0	
151	Low[3]	0	20,000	
152	Low[3]	0	20,000	
153	High[1]	1,100	669,100	
154	High[1]	[f]	0	
155	High[2]	4,200	1,368,000	
156.1	Low[3]	0	20,000	
156.2	Low[3]	0	20,000	
157.1	Low[3]	0	20,000	
157.2	Low[3]	0	20,000	
158	Low[3]	0	20,000	
159	High[1]	[g]	0	
160	Low[3]	0	20,000	

Table D-6 (Continued)

Identification	Description	Total Volume (m³)	Total Costs	O&M Cost
IHSS				
161	Low[3]	0	20,000	
162	Low[3]	0	20,000	
163.1	Low[3]	0	20,000	
163.2	Low[3]	0	20,000	
164.1	Low[3]	0	20,000	
164.2	Low[3]	0	20,000	
164.3	Low[3]	0	20,000	
165	Low[3]	0	20,000	
166.1	Low[3]	0	20,000	
166.2	Low[3]	0	20,000	
166.3	Low[3]	0	20,000	
167.1	Low[3]	0	20,000	
167.2	Low[3]	i	20,000	
167.3	Low[3]	0	20,000	
169	Low[3]	0	20,000	
170	High[1]	l	0	
171	High[1]	d	0	
172	Low[3]	0	20,000	
173	Low[3]	0	20,000	
174.1	High[1]	17,100	8,525,100	
174.2	High[1]	j	0	
175	Low[3]	0	20,000	
176	High[1]	100	178,100	
177	Low[3]	0	20,000	
181	Low[3]	0	20,000	
182	Low[3]	0	20,000	
183	High[2]	400	247,000	
184	Low[3]	0	20,000	
186	Low[3]	0	20,000	
187	Low[3]	0	20,000	
188	Low[3]	0	20,000	
189	Low[3]	0	20,000	
190	Low[3]	0	20,000	
191	Low[3]	0	20,000	
196	Low[3]	0	20,000	
197	Low[3]	0	20,000	
199	Low[3]	0	20,000	
200	Low[3]	0	20,000	
201	Low[3]	0	20,000	
202	Low[3]	0	20,000	
203	Low[3]	0	20,000	
205	Low[3]	0	20,000	
206	Low[3]	0	20,000	
207	Low[3]	0	20,000	
208	Low[3]	0	20,000	
209	Low[3]	0	20,000	
210	Low[3]	0	20,000	
213	Low[3]	0	20,000	
214	Low[3]	0	20,000	
215	Low[3]	0	20,000	
216.1	Low[3]	0	20,000	
216.2	Low[3]	0	20,000	
216.3	Low[3]	0	20,000	
PAC	High[1]	500	147,500	
UBC	Low[3]	0	129,000	
Contingency	High[1]	45,000	12,414,000	
	Subtotal	**115,000m³**	**$ 52,000,000**	**$ -**

Table D-6 (Continued)

Identification	Description	Total Volume (m³)	Total Costs	O&M Cost
Windblown Pu Contaminated Area	N/A			
Landfills				
OU7	Closure in place, RCRA Cap	-	8,000,000	52,000
OU5	Stabilize and cover	-	7,000,000	**
		-	$15,000,000	$ 52,000
Groundwater	Source removal with IHSS, groundwater management for Industrial Area, OU 1, OU 2 IHSS 118.1, and OU 7 groundwater plumes		$13,000,000	$ 4,277,000
Surface Water	Convert to flow through system		$ 1,000,000	***
Final Cover	N/A			
Overall Environmental Monitoring	During remediation and decomissioning activities			$ 11,900,000
	Post intermediate closure			$ 8,000,000
	Final			$ 7,300,000
TOTALS	Capital **Total**	115.000m³	$81,000,000	
Total O&M Costs	During remediation			$ 11,900,000
	Post intermediate closure			$ 12,300,000
	Final			$ 11,600,000

* Assume WM covers disposal cost
** Included in above figure
*** Included in overall Environmental Monitoring Cost

Description Notes:
1. Excavate, thermal desorption, final disposal
2. Excavate, final disposal
3. Implement NA/NFA Decision Document

Total Volume Notes
- a. Included in IHSS 121 pipeline
- b. Included in IHSS 124.3
- c. Included in IHSS 118.1
- d. Included in IHSS 128
- e. Included in UBC B559
- f. Included in UBC B774
- g. Included in IHSS 150.6
- h. Included in IHSS 153
- i. Included in landfill subtask
- j. Included in IHSS 174.1

Table D-7 Summary of IHSSs to be Remediated

Identification	Description	IHSS to be Remediated Alternative 1	Alternative 3	Alternative 4
IHSS				
101	Solar Ponds	x		
102	Oil Sludge Pit			
103	Chemical Burial			
104	Liquid Dumping			
105.1	Out-of-Service Fuel Tank			
105.2	Out-of-Service Fuel Tank			
106	Outfall			
107	Building 881 Hillside Oil Leak			
108	Trench T-1	x	x	x
109	Trench T-2	Completed	Completed	Completed
110	Trench T-3	x	x	x
111.1	Trench T-4	x	x	x
111.2	Trench T-5	x	x	x
111.3	Trench T-6	x	x	x
111.4	Trench T-7	x	x	x
111.5	Trench T-8	x	x	x
111.6	Trench T-9	x	x	x
111.7	Trench T-10	x	x	x
111.8	Trench T-11	x	x	x
112	903 Pad	x	x	x
113	Mound	x	x	x
114	Present Landfill	x	x	x
115	Original Landfill	x	x	x
116.1	447 West Loading Dock	x		
116.2	444 South Loading Dock	x		
117.1	North Site/Scrap Metal	x		
117.2	Middle Site Chemical Storage	x		
117.3	South Site Chemical Storage	x		
118.1	Solvent Spills West of 730	x	x	x
118.2	Building 776 Solvent Spill	x	x	x
119.1	West Scrap Metal Storage Area	x	x	x
119.2	East Scrap Metal Storage Area			
120.1	North Fiberglassing Area	x		
120.2	West Fiberglassing Area	x		
121	OWPL Pipelines and Tanks	x	x	x
122	Underground Concrete Tank	x	x	x
123.1	Valve Vault 7	x		
123.2	Valve Vault - 707	x	x	x
124.1	Holding Tank No. 68	x	x	x
124.2	Holding Tank No. 66	x	x	x
124.3	Holding Tank No. 67	x	x	x
125	Tank 66	x	x	x
126.1	Process Waste Tanks	x	x	x
126.2	Process Waste Tanks	x	x	x
127.1	Low Level Rad Waste Leak	x	x	x
127.2	Low Level Rad Waste Leak	x		
128	Oil Burn Pit No. 1	x	x	x
129	Oil Leak	x	x	x
130	Contaminated Soil Disposal Area			
131	Rad Site No. 1 - 700 Area	x	x	x
132	Rad Site No. 4700 Area	x	x	x
133.1	Ash Pit No. 1			
133.2	Ash Pit No. 2			
133.3	Ash Pit No. 3			
133.4	Ash Pit No. 4			
133.5	Incinerator			
133.6	Concrete Wash Pad			
134.1	Rad Metal Site - North	x	x	x
134.2	Rad Metal Site - South	x		
135	334 Cooling Tower			
136.1	Cooling Tower Pond	x		
136.2	Cooling Tower Pond	x		

Table D-7 (Continued)

Identification	Description	IHSS to be Remediated: Alternative 1	Alternative 3	Alternative 4
IHSS				
137	712/713 Cooling Tower	x	x	x
138	779 Cooling Tower	x	x	x
139.1	KOH, NaOH, Condensate Tanks	x		
139.2	Hydrofluoric Tank	x		
140	Hazardous Disposal Site	x	x	x
141	Sludge Dispersal Area			
142.1	Pond A-1	x		
142.10	Pond C-1			
142.11	Pond C-2			
142.12	Pond A-5 (Flume Pond)			
142.2	Pond A-2	x		
142.3	Pond A-3	x		
142.4	Pond A-4			
142.5	Pond B-1	x		
142.6	Pond B-2	x		
142.7	Pond B-3	x		
142.8	Pond B-4	x		
142.9	Pond B-5			
143	771 Outfall	x		
144	Sewer Line Overflow	x	x	x
145	Sanitary Waste Line Leak			
146.1	Process Waste Tank No. 31	x	x	cannot access
146.2	Process Waste Tank No. 32	x	x	cannot access
146.3	Process Waste Tank No. 34 West	x	x	cannot access
146.4	Process Waste Tank No. 34 East	x	x	cannot access
146.5	Process Waste Tank No. 30	x	x	cannot access
146.6	Process Waste Tank No. 33	x	x	cannot access
147.1	Maas Area	x	x	x
147.2	881 Conversion (Owen)	x		
148	Waste Leaks	x		
149.1	OPWL to SEPS	x	x	x
149.2	OPWL to SEPS	x	x	x
150.1	Rad Site North of 771	x		
150.2	Rad Site North of 771/776	x		
150.3	Rad Site Between 771/774	x		
150.4	Rad Site Northwest of 750	x		
150.5	Rad Site West of 707	x	x	x
150.6	Rad Site South of 779	x	x	x
150.7	Rad Site South of 776	x		
150.8	Rad Site Northeast of 779	x	x	x
151	Fuel Oil Spills	x		
152	Tank 221 Spills	x		
153	Oil Burn Pit No. 2	x	x	x
154	Pallet Burn Site	x	x	x
155	Lip Area (Americium Area)	x	x	x
156.1	334 Parking Lot	x		
156.2	Soil Disposal Area			
157.1	Rad Site North	x		
157.2	Rad Site South	x		
158	Rad Site - 551	x		
159	Rad Site - 559	x	x	x
160	Rad Site - 444 Parking Lot	x		
161	Rad Site, West of 664	x		
162	Rad Site No. 2,700 Area	x		
163.1	Pad Site 700 Area 3	x		
163.2	Americium Slab	x		
164.1	Rad Site - Concrete Slab	x		
164.2	Rad Site - 886 Spills	x		
164.3	Rad Site - 887 Pad	x		
165	Triangle Area			
166.1	Landfill Trench A			
166.2	Landfill Trench B			

Table D-7 (Continued)

Identification	Description	IHSS to be Remediated		
		Alternative 1	Alternative 3	Alternative 4
IHSS				
166.3	Landfill Trench C			
167.1	North Landfill Spray Area			
167.2	Landfill Pond Spray Area	x		
167.3	Landfill South Spray Area			
169	Hydrogen Peroxide			
170	PU&D Yard	x	x	x
171	Fire Training	x	x	x
172	Central Avenue Waste Spill	x		
173	South Dock 991	x		
174.1	PU&D Storage Areas	x	x	x
174.2	PU&D Storage Areas	x	x	x
175	Contractor Storage Facility			
176	S&W Yard	x	x	x
177	885 Drum Storage Area	x		
181	334 Cargo Contaminated Area			
182	444/453 Storage Area	x		
183	Gas Detox	x	x	x
184	991 Steam Cleaning Area			
186	VV 11, 12, 13	x		
187	Sulfuric Acid Spill	x		
188	Acid Leak			
189	Nitric Acid Tanks	x		
190	Caustic Leak			
191	Hydrogen Peroxide Leak	x		
196	Backwash Pond			
197	Scrap Metal	x		
199	Land Surface			
200	Great Western			
201	Standley Lake			
202	Mower Reservoir			
203	Inactive Hazardous Waste Storage			
205	460 Sump 3-Acid			
206	Inactive Tank D-836			
207	444 Acid Dumpster			
208	944/447 Waste Storage Area			
209	Surface Disturbance			
210	980 Cargo Contamination			
213	904 Pad	x		
214	750 Pad	x		
215	T-40 Tank 771	x		
216.1	East Spray Field			
216.2	East Spray Fields - Center			
216.3	East Spray Fields - South			
PAC		x	x	x
UBC		x	x	
Contingency		x	x	x

Note: x - IHSS will be remediated under this alternative.

Table D-8 Summary of Environmental Restoration Options

Identification	Alternative 1, Unrestricted: Description	Total Volume (m^3)	Total Cost	O&M Cost	Alternative 3, Retrievable, Monitored Storage and Disposal: Description	Total Volume (m^3)	Total Costs	O&M Cost
IHSS								
101	High[2]	41,500	12,371,500		Low[4]	0	20,000	
102	Low[4]	0	20,000		Low[4]	0	20,000	
103	Low[4]	0	20,000		Low[4]	0	20,000	
104	Low[4]	0	20,000		Low[4]	0	20,000	
105.1	Low[4]	0	20,000		Low[4]	0	20,000	
105.2	Low[4]	0	20,000		Low[4]	0	20,000	
106	Low[4]	0	20,000		Low[4]	0	20,000	
107	Low[4]	0	20,000		Low[4]	0	20,000	
108	High[1]	9,500	4,793,500		High[1]	2,300	1,258,300	
109	Completed	0	0		Completed	0	0	
110	High[1]	65,600	32,338,600		High[1]	1,400	816,400	
111.1	High[1]	88,600	43,631,600		High[1]	1,300	767,300	
111.2	High[1]	49,200	24,286,200		High[1]	700	472,700	
111.3	High[1]	16,400	8,181,400		High[1]	700	472,700	
111.4	High[1]	23,000	11,422,000		High[1]	700	472,700	
111.5	High[1]	23,000	11,422,000		High[1]	700	472,700	
111.6	High[1]	23,000	11,422,000		High[1]	700	472,700	
111.7	High[1]	16,400	8,181,400		High[1]	700	472,700	
111.8	High[1]	23,000	11,422,000		High[1]	700	472,700	
112	High[1]	21,100	10,489,100		High[1]	7,600	3,860,600	
113	High[1]	13,700	6,855,700		High[1]	2,700	1,454,700	
114	High[2]	*	0		Low[4]	'	20,000	
115	High[2]	*	0		Low[4]	'	20,000	
116.1	High[2]	100	158,500		Low[4]	0	20,000	
116.2	High[1]	100	178,100		Low[4]	0	20,000	
117.1	High[1]	1,000	620,000		Low[4]	0	20,000	
117.2	High[1]	12,300	6,168,300		Low[4]	0	20,000	
117.3	High[1]	700	472,700		Low[4]	0	20,000	
118.1	High[1]	1,500	865,500		High[1]	1,500	865,500	
118.2	High[1]	200	227,200		High[1]	30	143,730	
119.1	High[1]	10,600	5,333,600		High[1]	300	276,300	
119.2	Low[4]	0	20,000		Low[4]	0	20,000	
120.1	High[1]	100	178,100		Low[4]	0	20,000	
120.2	High[1]	900	570,900		Low[4]	0	20,000	
121-Pipelines	High[2]	101,400	49,916,400		High[1]	23,100	11,471,100	
121-Tanks	High[1]	**	0		High[1]	1,000	620,000	
122	High[1]	200	98,200		High[1]	100	178,100	
123.1	High[1]	*	0		Low[4]	0	20,000	
123.2	High[1]	*	0		High[1]	*	0	
124.1	High[1]	*	0		High[1]	*	0	
124.2	High[1]	*	0		High[1]	*	0	
124.3	High[1]	*	0		High[1]	3,400	1,798,400	
125	High[1]	*	0		High[1]	*	0	
126.1	High[1]	*	0		High[1]	5	131,455	
126.2	High[1]	*	0		High[1]	5	131,455	
127.1	High[1]	*	0		High[1]	*	0	
127.2	High[1]	*	0		Low[4]	0	20,000	
128	High[1]	200	98,200		High[1]	100	178,100	
129	High[1]	1,700	963,700		High[1]	1,700	963,700	
130	Low[4]	0	20,000		Low[4]	0	20,000	
131	High[1]	300	276,300		High[1]	200	227,200	
132	High[1]	*	0		High[1]	*	0	
133.1	Low[4]	0	20,000		Low[4]	0	20,000	
133.2	Low[4]	0	20,000		Low[4]	0	20,000	
133.3	Low[4]	0	20,000		Low[4]	0	20,000	
133.4	Low[4]	0	20,000		Low[4]	0	20,000	
133.5	Low[4]	0	20,000		Low[4]	0	20,000	
133.6	Low[4]	0	20,000		Low[4]	0	20,000	

Identification	Alternative 4, Mothball: Description	Total Volume (m^3)	Total Costs	O&M Cost
IHSS				
101	Low[4]	0	20,000	
102	Low[4]	0	20,000	
103	Low[4]	0	20,000	
104	Low[4]	0	20,000	
105.1	Low[4]	0	20,000	
105.2	Low[4]	0	20,000	
106	Low[4]	0	20,000	
107	Low[4]	0	20,000	
108	High[1]	2,300	1,258,300	
109	Completed	0	0	
110	High[1]	1,400	816,400	
111.1	High[1]	1,300	767,300	
111.2	High[1]	700	472,700	
111.3	High[1]	700	472,700	
111.4	High[1]	700	472,700	
111.5	High[1]	700	472,700	
111.6	High[1]	700	472,700	
111.7	High[1]	700	472,700	
111.8	High[1]	700	472,700	
112	High[1]	7,800	3,860,600	
113	High[1]	2,700	1,454,700	
114	Low[4]	'	20,000	
115	Low[4]	'	20,000	
116.1	Low[4]	0	20,000	
116.2	Low[4]	0	20,000	
117.1	Low[4]	0	20,000	
117.2	Low[4]	0	20,000	
117.3	Low[4]	0	20,000	
118.1	High[1]	1,500	865,500	
118.2	High[1]	30	143,730	
119.1	High[1]	300	276,300	
119.2	Low[4]	0	20,000	
120.1	Low[4]	0	20,000	
120.2	Low[4]	0	20,000	
121-Pipelines	High[1]	16,200	8,083,200	
121-Tanks	High[1]	1,000	620,000	
122	High[1]	20	138,820	
123.1	Low[4]	0	20,000	
123.2	High[1]	*	0	
124.1	High[1]	*	0	
124.2	High[1]	*	0	
124.3	High[1]	2,700	1,454,700	
125	High[1]	*	0	
126.1	High[1]	5	131,455	
126.2	High[1]	5	131,455	
127.1	High[1]	*	0	
127.2	Low[4]	0	20,000	
128	High[1]	100	178,100	
129	High[1]	1,700	963,700	
130	Low[4]	0	20,000	
131	High[1]	200	227,200	
132	High[1]	*	0	
133.1	Low[4]	0	20,000	
133.2	Low[4]	0	20,000	
133.3	Low[4]	0	20,000	
133.4	Low[4]	0	20,000	
133.5	Low[4]	0	20,000	
133.6	Low[4]	0	20,000	

Table D-8 (Continued)

Identification	Alternative 1, Unrestricted: Description	Alternative 1: Total Volume (m³)	Alternative 1: Total Cost	Alternative 1: O&M Cost	Alternative 3, Retrievable, Monitored Storage and Disposal: Description	Alternative 3: Total Volume (m³)	Alternative 3: Total Costs	Alternative 3: O&M Cost	Alternative 4, Mothball: Description	Alternative 4: Total Volume (m³)	Alternative 4: Total Costs	Alternative 4: O&M Cost
IHSS												
134.1	High[1]	2,300	1,258,300		High[1]	[a]	0		High[1]	[a]	0	
134.2	High[1]	2,400	1,307,400		Low[4]	0	20,000		Low[4]	0	20,000	
135	Low[4]	0	20,000		Low[4]	0	20,000		Low[4]	0	20,000	
136.1	High[1]	100	178,100		Low[4]	0	20,000		Low[4]	0	20,000	
136.2	High[2]	100	158,500		Low[4]	0	20,000		Low[4]	0	20,000	
137	High[1]	2,000	1,111,000		High[1]	30	143,730		High[1]	20	138,820	
138	High[1]	400	325,400		High[1]	10	133,910		High[1]	10	133,910	
139.1	High[2]	100	158,500		Low[4]	0	20,000		Low[4]	0	20,000	
139.2	High[1]	30	14,700		Low[4]	0	20,000		Low[4]	0	20,000	
140	High[1]	10,600	5,333,600		High[1]	800	521,800		High[1]	800	521,800	
141	Low[4]	0	20,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.1	High[2]	2,000	719,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.2	High[2]	1,800	660,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.3	High[2]	7,200	2,253,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.4	Low[4]	0	20,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.5	High[2]	2,000	719,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.6	High[2]	1,300	512,500		Low[4]	0	20,000		Low[4]	0	20,000	
142.7	High[2]	1,000	424,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.8	High[2]	900	394,500		Low[4]	0	20,000		Low[4]	0	20,000	
142.9	Low[4]	0	20,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.10	Low[4]	0	20,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.11	Low[4]	0	20,000		Low[4]	0	20,000		Low[4]	0	20,000	
142.12	Low[4]	0	20,000		Low[4]	0	20,000		Low[4]	0	20,000	
143	High[2]	[a]	0		Low[4]	0	20,000		Low[4]	0	20,000	
144	High[1]	200	227,200		High[1]	[a]	0		High[1]	[a]	0	
145	Low[4]	0	20,000		Low[4]	0	20,000		Low[4]	0	20,000	
146.1	High[1]	[b]	0		High[1]	[b]	0		Low[4]	[b]	20,000	
146.2	High[1]	[b]	0		High[1]	[b]	0		Low[4]	[b]	20,000	
146.3	High[1]	[b]	0		High[1]	[b]	0		Low[4]	[b]	20,000	
146.4	High[1]	[b]	0		High[1]	[b]	0		Low[4]	[b]	20,000	
146.5	High[1]	[b]	0		High[1]	[b]	0		Low[4]	[b]	20,000	
146.6	High[1]	[b]	0		High[1]	[b]	0		Low[4]	[b]	20,000	
147.1	High[1]	[b]	0		High[1]	[a]	0		High[1]	[a]	0	
147.2	High[2]	1,100	453,500		Low[4]	0	20,000		Low[4]	0	20,000	
148	High[1]	2,800	1,503,800		Low[4]	0	20,000		Low[4]	0	20,000	
149.1	High[1]	[b]	0		High[1]	[a]	0		High[1]	[a]	0	
149.2	High[1]	[b]	0		High[1]	[a]	0		High[1]	[a]	0	
150.1	High[1]	300	276,300		Low[4]	0	20,000		Low[4]	0	20,000	
150.2	High[2]	[a]	0		Low[4]	0	20,000		Low[4]	0	20,000	
150.3	High[1]	600	423,600		Low[4]	0	20,000		Low[4]	0	20,000	
150.4	High[2]	[a]	0		Low[4]	0	20,000		Low[4]	0	20,000	
150.5	High[1]	[a]	0		High[1]	[a]	0		High[1]	[a]	0	
150.6	High[2]	3,100	1,043,500		High[2]	5	130,475		High[2]	5	130,475	
150.7	High[2]	[a]	0		Low[4]	0	20,000		Low[4]	0	20,000	
150.8	High[2]	[a]	0		High[2]	[a]	0		High[2]	[a]	0	
151	High[2]	500	245,500		Low[4]	0	20,000		Low[4]	0	20,000	
152	High[1]	500	374,500		Low[4]	0	20,000		Low[4]	0	20,000	
153	High[1]	2,100	1,160,100		High[1]	1,100	669,100		High[1]	1,100	669,100	
154	High[1]	[a]	0		High[1]	[c]	0		High[1]	[c]	0	
155	High[2]	29,600	8,861,000		High[2]	4,200	1,368,000		High[2]	4,200	1,368,000	
156.1	High[2]	8,500	2,636,500		Low[4]	0	20,000		Low[4]	0	20,000	
156.2	Low[4]	0	20,000		Low[4]	0	20,000		Low[4]	0	20,000	
157.1	High[1]	3,200	1,700,200		Low[4]	0	20,000		Low[4]	0	20,000	
157.2	High[2]	1,100	453,500		Low[4]	0	20,000		Low[4]	0	20,000	
158	High[1]	3,200	1,700,200		Low[4]	0	20,000		Low[4]	0	20,000	
159	High[1]	[a]	0		High[1]	[a]	0		High[1]	[a]	0	
160	High[1]	100	178,100		Low[4]	0	20,000		Low[4]	0	20,000	
161	High[2]	300	217,500		Low[4]	0	20,000		Low[4]	0	20,000	

Table D-8 (Continued)

Identification	Alternative 1, Unrestricted				Alternative 3, Retrievable, Monitored Storage and Disposal				Alternative 4, Mothball			
	Description	Total Volume (m³)	Total Cost	O&M Cost	Description	Total Volume (m³)	Total Costs	O&M Cost	Description	Total Volume (m³)	Total Costs	O&M Cost
IHSS												
162	High[1]	9,900	4,989,900		Low[3]	0	20,000		Low[3]	0	20,000	
163.1	High[1]	20	9,800		Low[3]	0	20,000		Low[3]	0	20,000	
163.2	High[2]	'	0		Low[3]	0	20,000		Low[3]	0	20,000	
164.1	High[1]	100	178,100		Low[3]	0	20,000		Low[3]	0	20,000	
164.2	High[1]	4,100	2,142,100		Low[3]	0	20,000		Low[3]	0	20,000	
164.3	High[2]	1,700	630,500		Low[3]	0	20,000		Low[3]	0	20,000	
165	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
166.1	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
166.2	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
166.3	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
167.1	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
167.2	High[2]	•	0		Low[3]	'	20,000		Low[3]	'	20,000	
167.3	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
169	High[1]	0	0		Low[3]	0	20,000		Low[3]	0	20,000	
170	High[1]	19,100	9,507,100		High[1]	'	0		High[1]	'	0	
171	High[1]	•	0		High[1]	•	0		High[1]	•	0	
172	High[2]	200	188,000		Low[3]	0	20,000		Low[3]	0	20,000	
173	High[1]	200	227,200		Low[3]	0	20,000		Low[3]	0	20,000	
174.1	High[1]	17,100	8,525,100		High[1]	17,100	8,525,100		High[1]	17,100	8,525,100	
174.2	High[1]	100	178,100		High[1]	'	0		High[1]	'	0	
175	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
176	High[1]	28,200	13,975,200		High[1]	100	178,100		High[1]	100	178,100	
177	High[1]	2,600	1,405,600		Low[3]	0	20,000		Low[3]	0	20,000	
181	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
182	High[2]	1,700	630,500		Low[3]	0	20,000		Low[3]	0	20,000	
183	High[2]	1,100	453,500		High[2]	400	247,000		High[2]	400	247,000	
184	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
186	High[1]	300	278,300		Low[3]	0	20,000		Low[3]	0	20,000	
187	High[2]	20	134,900		Low[3]	0	20,000		Low[3]	0	20,000	
188	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
189	High[2]	300	217,500		Low[3]	0	20,000		Low[3]	0	20,000	
190	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
191	High[2]	40	140,800		Low[3]	0	20,000		Low[3]	0	20,000	
196	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
197	High[1]	200	227,200		Low[3]	0	20,000		Low[3]	0	20,000	
199	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
200	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
201	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
202	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
203	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
205	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
206	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
207	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
208	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
209	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
210	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
213	High[2]	2,500	1,227,500		Low[3]	0	20,000		Low[3]	0	20,000	
214	High[2]	2,500	1,227,500		Low[3]	0	20,000		Low[3]	0	20,000	
215	High[1]	•	0		Low[3]	0	20,000		Low[3]	0	20,000	
216.1	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
216.2	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
216.3	Low[3]	0	20,000		Low[3]	0	20,000		Low[3]	0	20,000	
PAC	High[1]	1,500	865,500		High[1]	500	374,500		High[1]	500	147,500	
UBC	High[1]	120,300	59,196,300		High[1]	60,200	29,687,200		Low[3]	0	129,000	
Contingency	High[1]	45,000	22,095,000		High[1]	45,000	12,414,000		High[1]	45,000	12,414,000	
	Subtotal	895,000m³	$430,000,000	-	Subtotal	181,000m³	$ 85,000,000	$ -	Subtotal	115,000m³	$ 52,000,000	$ -

Table D-8 (Continued)

Identification	Alternative 1, Unrestricted: Description	Total Volume (m^3)	Total Cost	O&M Cost	Alternative 3, Retrievable, Monitored Storage and Disposal: Description	Total Volume (m^3)	Total Costs	O&M Cost	Alternative 4, Mothball: Description	Total Volume (m^3)	Total Costs	O&M Cost
Windblown Pu Contaminated Area	Excavate, Dispose Offsite*	850,000m^3	$ 251,000,000	-	N/A				N/A			
Landfills												
OU7	Excavate, Dispose Offsite*	310,000m^3	15,000,000	-	Closure in place, RCRA Cap	-	7,910,000	52,000	Closure in place, RCRA Cap	-	8,000,000	52,000
OU5	Excavate, Dispose Offsite*	70,000m^3	4,000,000	-	Excavate, Dispose Onsite*	70,000m^3	3,920,000	-	Stabilize and cover	-	7,000,000	**
		380,000m^3	$19,000,000	$ -	Subtotal	70,000m^3	$ 12,000,000	$ 52,000		-	$15,000,000	$ 52,000
Groundwater	Barrier wall for Industrial Area, Groundwater Management, for OU 2, IHSS 118.1, and OU 7 Groundwater plumes		$72,000,000	$ 2,900,000	Source removal with IHSS, groundwater management for OU 2, IHSS 118.1, and OU 7 groundwater plumes		$22,500,000	$ 1,128,000	Source removal with IHSS, groundwater management for Industrial Area, OU 1, OU 2 IHSS 118.1, and OU 7 groundwater plumes		$39,000,000	$ 4,277,000
Surface Water	Convert to flow through system during remediation, convert to wetlands after		$4,400,000	***	Convert to flow through system during remediation, convert to wetlands after		$4,400,000	***	Convert to flow through system		$ 1,400,000	***
Final Cover	N/A				Final cover over PA and 800 area		$100,000,000	$ 1,000,000	N/A			
Overall Environmental Monitoring	During remediation and decomissioning activities			$ 11,900,000	During remediation and decomissioning activities			$ 11,900,000	During remediation and decomissioning activities			$11,900,000
	Post intermediate closure			$ -	Post intermediate closure			$ 2,770,000	Post intermediate closure			$ 8,000,000
	Final			$ 640,000	Final			$ 2,090,000	Final			$ 7,300,000
TOTALS	Capital	2,125,000m^3	$776,400,000		Capital Total	251,000m^3	$223,900,000		Capital Total	115,000m^3	$107,400,000	
Total O&M Costs	During remediation			$ 11,900,000	During remediation			$ 11,900,000	During remediation			$11,900,000
	Post intermediate closure			$ -	Post intermediate closure			$ 4,900,000	Post intermediate closure			$12,300,000
	Final			$ 3,500,000	Final			$ 4,200,000	Final			$11,600,000

* Assume WM covers disposal cost
** Included in above figure
*** Included in overall Environmental Monitoring Cost

Description Notes:
1. Excavate, thermal desorption, final disposal
2. Excavate, final disposal
3. Implement NA/NFA Decision Document

Total Volume Notes for Alternative 1
a. Included in landfill subtask
b. Included in IHSS 121
c. Included in IHSS 172 and 126
d. Included in IHSS 160.6
e. Included in IHSS 153
f. Included in IHSS 150.1
g. Included in IHSS 134.1 and 134.2

Total Volume Notes for Alternatives 3 and 4
a. Included in IHSS 121 pipeline
b. Included in IHSS 124.3
c. Included in IHSS 118.1
d. Included in IHSS 128
e. Included in UBC B559
f. Included in UBC B774
g. Included in IHSS 150.6
h. Included in IHSS 153
i. Included in landfill subtask
j. Included in IHSS 174.1

APPENDIX E

INFRASTRUCTURE

1.0 INTRODUCTION

Appendix E discusses the infrastructure required to support each of the alternatives as described under the Accelerated Site Action Project (ASAP) Phase II, Section 2. Infrastructure is defined as common utilities and services that support plantwide activities both during the ASAP alternative implementation stage and after the Site has reached the interim end state as described in each alternative. The period during the ASAP alternative implementation phase is that period in which new facilities are being built or existing ones modified to store SNM and waste; and activities are progressing to, deactivate, decontaminate, decommission, and in some alternatives, demolish the facilities. The period after the Site has reached the interim state described, is that period when SNM and waste are stored onsite and the only remaining activities are the monitoring and shipment offsite of the stored SNM and waste.

For those alternatives where SNM and waste are no longer at the Site, all utilities and services would be discontinued. Otherwise, this appendix discusses any new infrastructure activities required as a result of whichever ASAP alternative is ultimately chosen, and the effect of each ASAP alternative on existing activities at Rocky Flats.

The discussion is divided into four areas: (1) Utilities; (2) Services; (3) New projects required by ASAP; and (4) Effect of ASAP on existing projects. References to the impact of all the various alternatives are contained within each of these four areas.

Utilities discussed in this appendix are:

- Water
- Sanitary sewer
- Steam
- Electricity
- Natural gas
- Nitrogen
- Fuel oil

Services discussed include:

- Communication
- Laundry
- Plant Security
- Custodial Services
- Emergency Services
- Logistics and Property Mgmt
- Facility Leasing
- Laboratory services
- Facility and Equipment Maintenance
- Filter/Respirator Testing
- Food Services
- Radiological Protection

Infrastructure utilities and services were assessed in ASAP Phase I against a defined alternative that is very similar to Alternative 3e, Entombment and Landfill. ASAP Phase II is an examination of all the alternatives and projects the possible outcomes of the conceptual final vision for the Site. The alternatives were reviewed against operating and maintenance (O&M) costs and any one-time costs. In some cases the inclusion and refinement of those costs led to different conclusions in Phase II than in Phase I. For example, Phase I recommended water purification units; Phase II recommends running a water line from offsite for most alternatives. Each section discusses the rationale for the conclusions reached and the recommendations made for various alternatives.

In the case of Alternative 2, BEMR 1, the Baseline Environment Management Report was reviewed, and because the report was very general with regard to infrastructure, it was only validated.

2.0 SCOPE

Many of the support services required for all of the alternatives during and after their implementation as described in this appendix are interrelated with other Site activities. Several issues and cost items involved in the infrastructure are more appropriately included in other sections of this document as shown below.

2.1 Utilities

Facility Decommissioning will provide the cost and options for deactivation and demolition of overhead and underground utilities as required in each alternative. Gas fired heating systems required by any new facilities for SNM and waste storage are included in the discussions which propose the facilities. Billing charges for public utilities are included as part of Support Costs in Appendix G, Cost Methodology.

2.2 Services

Security force manpower requirements included in this section are predicated on the minimizing of the security force necessary to comply with DOE Special Nuclear Material regulations.

The recommendations on Site services are directly tied to the various alternatives. The scheduled duration of the selected alternative plays a major role in the Site Services Infrastructure support.

Emergency response capability within Emergency Preparedness, Fire Services, and Occupational Medicine must be maintained throughout the ASAP process, regardless of the alternative. Emergency response capability and resources are directly dependent on the hazards identified for each of the alternatives. As facilities and hazards are eliminated, emergency response support can be reduced to the point of using existing staffing, or contracted assistance for professional response.

2.3 Projects Required by ASAP

This appendix includes only those projects that are common to all or most facilities or processes on Site. It does not include new projects that might be required by any other specialty area to support its completion only. Although future infrastructure projects are very dependent on the conclusions reached in other areas, the estimates provided in this section can only be based on the preliminary conclusions reached in other areas.

Projects discussed in this section are very dependent on the timeline to complete the various alternatives. Alternatives completed in a shorter timeframe will result in less money being spent on upgrades and/or repairs.

2.4 Effect of ASAP on Existing Projects

Flexible regulatory strategies are being explored for applicable projects, such as the December 1998 federal deadline for closure of underground storage tanks. A decision to descope specific project elements will hinge on the specific strategy. Potential savings on projects discussed in this appendix will come toward the end of the project (in the outer years), not in the beginning of the projects.

In the case of existing projects as well as new ones, estimates presented in this appendix can only be based on the preliminary conclusions reached in other area.

3.0 GENERAL ASSUMPTIONS

The projected requirements for Site infrastructure during and after implementation of a selected ASAP alternative were based on the following assumptions. The following general assumptions affect projected requirements for Site infrastructure during and after completion of ASAP.

3.1 Utilities

One of the nearby communities would be willing to supply potable water to the Site. The assumption here is that the Site would pay to install the water line and that a local community would have the water capacity to support Rocky Flats along with its other future development plans. However, it is worth noting that the stakeholders and regulators believe local communities will be interested in running utilities to develop this area in the near future.

It is also evident that local communities will not accept Rocky Flats sewage which runs through existing sewer lines. Even confining sewage to the few buildings remaining on Site, and running that sewage through new pipelines will likely not eliminate the requirement for extensive testing and analysis.

In the case of Alternative 1, Unrestricted, the buildings will be in an operating condition for an extended time and there is no SNM or waste storage.

The new interim SNM storage facility will not require an inert atmosphere for storage of the SNM.

3.2 Services

Site population will remain relatively stable during the D&D phase until late in the project and then decline to approximately 300 FTE after implementation of whatever alternative is chosen.

Based on the current building D&D schedule for the various alternatives, it is apparent that the facility decommissioning activities will exceed the rate at which the population is reduced, necessitating the relocation of displaced personnel to a leased offsite facility.

An emergency response capability, either inherent or contracted, must be maintained as long as any material is stored or any facilities remain onsite.

Hazard assessments, as modified for changes in storage locations and configurations, will form the basis for emergency planning for response.

An Emergency Operations Center (EOC) will be maintained to support emergency response.

Joint emergency response planning and interface with the State of Colorado and local municipal emergency response agencies will continue.

Occurrence reporting responsibilities will increase during facility D&D operations. An inherent emergency medical capability must be maintained.

Health effects studies and former workers' health programs will be continued.

3.3 New Projects Required/Affected by ASAP

Under all the alternatives, Buildings 371, 559, 707 and associated support buildings within the Protected Area (PA) will continue to be operational beyond 2000. Decommissioning activities will extend beyond 2000.

Building utilities and vital safety systems (VSS) will be required within a building until deactivation is complete. Electricity and fire water to the building will be required through strip-out and decontamination. Deactivated buildings will be in a state of passive ventilation.

Restart and other costs associated with building infrastructure components are not included in this document if a building is reactivated after being deactivated to complete decommissioning.

Life-cycle cost of the activity and affected operations is an important element in the evaluation process. Compensatory and maintenance savings after an activity is completed will be used to calculate cost pay-back based on the shortest expected operational life of the installed activity established by selected ASAP schedules.

The expected remaining life of the infrastructure facilities, systems, and components before replacement has been factored into the alternatives. If maintenance or compensatory measures can reasonably extend the service life to meet or exceed need dates from ASAP alternative schedules, then some new and/or existing activities may be deleted or descoped.

3.3.1 The above assumptions are universal across the alternatives. The assumptions that follow are based on the individual alternatives.

Alternative 1, Unrestricted –There will be a gradual decrease in Site personnel and services as ASAP implementation progresses. There will be no new construction of facilities except new storage to facilitate offsite shipment and safe interim storage of SNM and radioactive waste. Cost estimates are in current year (FY96) dollars.

Alternative 1, Unrestricted would ultimately result in the excavation and removal of the contaminated sites and underground infrastructure components. Utility distribution systems (communications, water, sewer, alarms) will be severely disturbed during the cleanup process. Existing activities that affect utility distribution should be evaluated for ease of reconfiguration to maintain continuity of services until no longer needed.

Alternatives 3a, Phased Shipment; 3c, Excavation; 3d, Leveled Buildings; and 3e, Entombment and Landfill –The Site population will remain relatively stable until late in the project at which time there will be a significant decrease resulting in a population of approximately 300 at the end.

Public and/or commercial infrastructure systems e.g., utilities, telephone, paging will be installed to the maximum possible prior to the end state to support minimal onsite interim storage facilities for SNM and radioactive waste projected at the end state.

Onsite disposal or retrievable interim storage will include facilities for waste and SNM storage. Infrastructure activities will be evaluated to determine applicability of mid-and long-term support for such facilities. For example, reconfiguration of the 13.8 Kilovolt (KV) electrical system would support new electrical needs.

In Alternative 3b, Priority Shipment, the rate of accelerated shipments will require virtually immediate upgrades to the roads to handle the increased rate of traffic and the weight of the loaded trucks. There will also be no new SNM storage or waste facilities. Instead, existing buildings on Site will be modified for SNM and waste storage. Since a number of existing facilities will be used, the existing steam plant and waste water treatment plant would remain on-line. A sewage lagoon is impractical for that large a number of buildings, and retrofitting gas-fired boilers into all the storage facilities would cost more than operating the existing steam plant.

Alternative 4, Mothball – The deactivated buildings will be in a passive state. Dry-pipe sprinkler systems, the fire-water riser alarm, and room lighting for watch tours will be the only ongoing utility requirements. Structural integrity will be maintained to protect building contents. The cost to convert wet-pipe fire suppression systems to dry-pipe systems will be included in deactivation funding requirements. Necessary infrastructure will be maintained to ensure the safety of facilities. All facilities will be left standing after being placed in a safe configuration unless it makes economic sense to demolish them.

4.0 ALTERNATIVE OPTIONS

4.1 Utilities

4.1.1 Water

The use of public water sources by the Site depends on the willingness of local communities to supply the water. The cost of running the supply line to Rocky Flats from the proximity of 100th Avenue and Simms St. is approximately $5.4 million, and city fees will approximate $230 thousand per year. The existing Rocky Flats water treatment plant and fire water system costs $885 thousand for operation and maintenance per year. Based on those figures, it would take slightly more than 8 years to pay off a new public water system at current usage rates. For that reason the choice in ASAP Phase I was to keep the existing water treatment plant operational until late in the project and then use the raw water currently supplied to the Site from Ralston Reservoir, make the necessary revisions to provide a suitable fire protection system, and provide water purification units in each operating building for a potable water supply. That could be done at a one-time cost of $750 thousand for the fire water system and $350 thousand for water purification units with a capacity of 200 to 300 people. Yearly operation and maintenance costs would run approximately $50 thousand for the water system. Yearly costs for city water for 200 to 300 people is estimated at $8 thousand. Based on those figures, it is more costly over a longer period to keep the water plant and convert to self-contained purification units than it is to run a water line from offsite. It is assumed that Alternative 3e, Entombment and Landfill, will take longer than 8 years to reach the point of only minimal facilities onsite. Therefore, if agreements could be reached, the preferred choice for a water supply is to run a waterline from a local community. Once that could be accomplished, the Site water treatment plant would be deactivated.

In the case of Alternative 1, Unrestricted, the water treatment plant would remain operational until the number of buildings and Site population declined and a new waterline could be installed. That is also true with Alternatives 3a, 3b, 3c, and 3d. Alternative 4, Mothball, would require the same rationale as Alternative 3e, Entombment and Landfill, except that the cost of maintaining fire water and minimal electrical power to the facilities would continue indefinitely.

4.1.2 Sewer

Current figures estimate that it would cost $2.3 million to install a public sewer line from the proximity of 100th Avenue and Simms St. While there are no actual quotes on annual charges to use public treatment facilities, a comparison can be used. Longmont charges a local turkey processing plant $275 thousand per quarter for sewage treatment. Rocky Flats by comparison is much larger, at least in the interim, and will minimally cost more than the annual $1.9 million O&M costs for Building 995, the Waste Water Treatment Plant. In addition, there are likely to be substantial analysis charges for sewage from Rocky Flats. All this is predicated on a local community accepting sewage that has been piped through existing pipelines at Rocky Flats.

Since the Waste Water Treatment Plant requires a minimum flow rate to be effective, it is assumed that an alternate system would have to be installed as the number of buildings declined. The most economical system is a centrally located sewage lagoon that could be constructed for approximately $250 thousand and could service several buildings. Annual O&M costs are estimated at $25 thousand. This is the system that is proposed for Alternative 1, Unrestricted, after most of the buildings are deactivated and only the SNM interim storage facility and a few other buildings remain. Until that time the existing sewage treatment plant could be used. All the other alternatives, except Alternative 3b, Priority Shipment, would use the same system; however, the timelines for installing the lagoon may vary. Since a number of existing facilities scattered around the plant would be modified for SNM and waste interim storage under Alternative 3b, Priority Shipment, sewage lagoons would be impractical. The existing waste water treatment plant would therefore remain in service until SNM and wastes are shipped offsite.

4.1.3 Steam

Steam provides heat in the majority of the buildings at Rocky Flats. Annual O&M costs for the Steam Plant are $1.72 million. The only alternative to steam heat is natural gas which is supplied to the Site now. However, the size of the gas supply line is only adequate to heat a limited number of buildings. Currently the annual cost of gas usage at the Site, which is a fraction of the steam requirements, is $734 thousand. Heating additional buildings with gas would soon exceed the cost of steam heating. However, as the number of buildings requiring heat declines, particularly the large buildings, the option for gas heating becomes more advantageous.

For Alternative 1, Unrestricted, gas-fired boilers would need to be installed in the new SNM interim storage facility, the new TRU waste interim storage facility and the new LLW/LLMW interim storage facility. These boilers are already figured into the cost of the new facilities. As the Site population and the number of buildings decline, it would be advantageous to leave gas and electrically heated buildings, such as Buildings 130, 131 and the 130 trailers, operational for administrative purposes rather than use the steam-heated buildings. This would enable the steam plant to be deactivated and demolished as the cost of steam heat became uneconomical in comparison to gas or electric heat. Using this plan it is anticipated that the steam plant would be deactivated in the last third of the project, and the cost of gas heat would not exceed $750 thousand per year and would decline to zero at the end of the alternative.

Alternatives 3a, 3c, 3d, 3e, and 4 would follow the same rationale as Alternative 1, except that during the project, the steam plant would remain active until the last year, at which time the remaining facilities would be heated by gas, including the new SNM interim storage facility and TRU interim storage facility. After all the buildings except the SNM and TRU interim storage facilities are deactivated, the annual cost of gas should not exceed $250 thousand. For Alternative 3b, Priority Shipment, retrofitting all the remaining interim storage facilities would be more expensive than continuing the operation of the existing steam plant.

4.1.4 Electricity

Electricity requirements would be handled similarly for each alternative. Rocky Flats currently pays $6 million to $7 million in electricity costs to Public Service annually;

maintenance costs are $1.5 million per year. A current line item activity would replace the existing substation, 555/558, with a new one, 679/680, at the corner of Central Avenue and 7th Avenue. This substation would have ample capacity to provide sufficient power to the Site in its current configuration. The activity could be complete as early as 1998. Having only one new substation configured to supply power to the entire plant would likely reduce maintenance costs during the ASAP project implementation, but the majority of the costs are from the substation into the buildings. For purposes of ASAP proposals, a gradual reduction is anticipated in electricity and operation and maintenance costs from the current figure to approximately $500 thousand, including $100 thousand maintenance costs, after ASAP is complete in the Monitored, Retrievable Storage/Disposal Alternatives, 3a through 3e. Alternative 1, Unrestricted, would result in a gradual decrease in current operating costs to no cost at the end of the alternative's implementation but that will take a much longer period of time. Alternative 4, Mothball will result in a gradual decrease in costs to $500 thousand, including $100 thousand maintenance costs, when all buildings are vacated and only the SNM storage and waste interim storage facilities remain for an indefinite period.

4.1.5 Natural Gas

Gas services have already been discussed in conjunction with the steam service. It is anticipated that gas costs would decline through alternative implementation from the current cost of $750 thousand to $100 thousand annually. Buildings requiring gas service would decline, but the new facilities in all the alternatives except Alternative 3b, Priority Shipment, would be fitted with gas-fired boilers and remain onsite until the SNM and waste is gone. Alternative 3b, Priority Shipment, would require continuing steam operations and not require conversion to gas heating.

4.1.6 Nitrogen

Nitrogen capacities are dependent on the inert atmospheres required. It is assumed that inert atmospheres will be required only as long as the SNM is kept in Buildings 371 and 707. After the material is in the SNM interim storage facility, inert atmospheres would no longer be required. The nitrogen plant is operated under a service contract valued at $400 thousand per year. As SNM is consolidated and production buildings are deactivated, the nitrogen requirements would decline, but it is anticipated that the nitrogen plant would continue operation until all material is in the new SNM interim storage facility because trucking liquid product is extremely expensive. For example, to maintain the volume of nitrogen currently supplied by the nitrogen plant would cost $16 thousand per day or $5.8 million per year. Just keeping Building 371 supplied by a trucking operation would be more expensive than operating the nitrogen plant. This rationale applies to all alternatives. In the case of Alternative 3b, Priority Shipment, it is assumed that the SNM interim storage in Building 371 will still be in a state that it is not pyrophoric.

4.1.7 Fuel Oil

Plans are currently in progress to sell the remainder of the fuel oil stored in the two large tanks on Central Avenue to a local vendor. The tanks will then be demolished as early as 1996. In an agreement with the vendor, as payment for the fuel oil in the tanks, fuel oil will be trucked back to Rocky Flats on an as-needed basis, for the life of the steam plant.

Utility Summary

Table E-1 summarizes the "steady state" annual operation and maintenance costs for each utility both during the project and after the project has reached the state as described in the alternatives, which are listed across the top of the table. Actual decreases in utility services would occur throughout the during state and those decreases in operating costs are reflected in the cost profiles assimilated by cost estimating.

4.2 Services

This section discusses the various options for the projected requirements of Support Services tied to the various alternatives as outlined Section 2. For ease of presentation and clarity, the following rationale is provided for the reader. The various alternatives presented do not significantly affect the Support Services infrastructure from one alternative to the next during the D&D phase as much as after completion of the initial D&D activities and during the on-going caretaker requirements of the selected alternative. Most of the services covered in this section are required depending on site population and the duration of a selected D&D alternative. Therefore, unless noted within the text, the Site Services support during D&D activities will be the same for each alternative.

4.2.1 Communication Services

This section under Communication Services will encompass the following:

Central Computer Facility (CCF)
Telecommunications
Telephone
Radio
Data
Pagers
Broadcast Video
Personal Computing (PC)
Records Management

All existing mainframe-based computer applications would be replaced with client/server technology to provide for cost control and flexibility. In 2005, the initial conversion to client/server would be approaching 10 years of age, and a decision would need to be made on whether to reinvest to "state of the art" or live with the 10-year-old system to the end state.

Demand for client/server computer applications, both in number and type, would decline as the end state approaches. However, many core applications support would not decline in scope but merely in user numbers until the Site population approached the end state number. This implies that core applications would be required until nearly the end of the alternatives.

The Central Computing Facility (CCF) currently resides in Building 881 and consists of both classified and unclassified computing. There are plans to downsize the facility as the change is made from the current mainframe to a client/server application. The Client/Server Facility (CSF) is a required element that will remain during the D&D phases of all the alternatives. As peak demand decreases on the unclassified CCF, a move to an offsite location at a one-time cost of $500 thousand would occur.

Table E-1
Utility Operation and Maintenance Costs
($000)

UTILITIES		ALTERNATIVE 1	3a	3b	3c	3d	3e	4
Water	– during	$ 885	$ 885	$ 885	$ 885	$ 885	$ 885	$ 885
	– after	0	8	8	8	8	8	8
Sewer	– during	1900	1900	1900	1900	1900	1900	1900
	– after	0	21	450	21	21	21	21
Steam	– during	1720	1720	1720	1720	1720	1720	1720
	– after	0	0	400	0	0	0	0
Electrical	– during	1500	1500	1500	1500	1500	1500	1500
	— after	0	100	100	100	100	100	100
Gas	– during	750	750	750	750	750	750	750
	– after	0	100	100	100	100	100	100
Nitrogen	– during	400	400	400	400	400	400	400
	– after	0	0	0	0	0	0	0
Fuel Oil	– during	0	0	0	0	0	0	0
	– after	0	0	0	0	0	0	0
Total	– during	$7,155	$7,155	$7,155	$7,155	$7,155	$7,155	$7,155
	– after	0	$ 229	$1,058	$ 229	$ 229	$ 229	$ 229

A classified computer facility would need to be retained onsite as long as nuclear material remains onsite. Dependent on the retention of some of the classified computer systems, a one-time buildout in one of the long-term buildings (i.e., 371) to house a classified computer facility would cost $1,600 thousand including a heating, ventilation, and air conditioning raised floor and an emergency generator..

Telecommunications

Telecommunications provides the basis for five Site communications systems: Telephone, Radio, Data Communications, Paging and Broadcast Video. Some form of communications will always be required regardless of the chosen end state. As the Site population moves to offsite facilities, onsite communication would rely more and more on wireless communication services. Each form of communications is briefly discussed as to the future needs and considerations for onsite/offsite requirements.

Telephone

Telephone-based voice communications services will always be required on Site. Regardless of how these services are provided (e.g., site-owned, site-privatized, commercially purchased) a point-of-presence for the local service provider will be required. Some mechanism is required to provide dial-tone to the actual telephone instrument.

Building 112 is the current distribution center for dial-tone around the Site with three telephone remote nodes in Buildings T130A, T130H, and T893A. The communication loop provided under the Criticality Alarm and Plant Annunciation System (CAPASU) activity will facilitate any rerouting of phone and communication lines. In addition, remediation and demolition of other buildings and facilities will require the flexible and easily reconfigured communication system provided under CAPASU. The telephone infrastructure will be site-owned and operated until a specific population trigger level is reached at the Site to warrant a switch to a commercial system.

Radio Communications

The radio system is based in two separate buildings: the primary system is located in Building 121 and the secondary is located in Building 763. As long as a protective force is required, wireless services will be required. Encryption is required to protect the sensitivity of radio communications and to prevent exploitation. Use of a self-contained radio system that could meet the requirements of a protective force requires further investigation.

Data Communications

Data communications will be required in any current and/or future computing environment including client/server. The current onsite data communications infrastructure is keyed to certain buildings and depending on the final decommissioning schedule and the need for downstream data communications, significant rerouting may be required. These buildings include 444, 889, 883, 881, 750, 331 and 112. Other buildings act as hubs for a cluster of surrounding buildings. Relocating people to offsite facilities will eliminate this impact.

Offsite communications to a facility such as Interlocken would be a major undertaking requiring high speed connection between Interlocken and the Site. Without detailed planning, an order-of-magnitude cost estimate would be $500 – $1,000 per connection.

Paging System

Relocating personnel will not relieve the requirements to provide pager communications; in fact it may increase the demand and requirements. The paging system should be commercialized as soon as possible after a specific population trigger is reached. The current system that supports the Site costs approximately $96 thousand per year. A similar commercial service for 800 clients is $8 thousand per year.

Broadcast Video

The Site's video infrastructure is a cable television distribution system. This infrastructure feeds through various buildings on Site in such a way that video distribution in one building is dependent on the state of the video distribution system in the upstream building. Therefore, elimination of one building in the distribution path will cause a loss of broadcast video capabilities to all downstream buildings. To maintain the capability, the cable would have to be rerouted around the eliminated building.

Relocating personnel offsite would eliminate this requirement, and monitoring of a trigger level in support of Broadcast Video should be a factor in evaluating the continuing need for this system.

Personal Computing (PC)

Personal Computing Support Services, PC Staging, E-mail and the Help Desk are all client/server dependent and as the Site population declines during and after the D&D process, the demand will be self-correcting to the level of need.

Records Management

Records Management services include mail service, correspondence control, printing services, graphics services, and photography. These services are all client/server oriented and as such will be dependent on whether the Site population is onsite and offsite. As a specific trigger level is established for each of these services, other commercial services will be reviewed.

4.2.2 Emergency Services

Emergency Services consists of three areas: (1) Emergency Preparedness; (2) Fire Prevention and Protection; and (3) Occupational Medicine.

Emergency Preparedness

As hazardous materials are consolidated and hazards decrease, the need for an extensive formalized emergency preparedness organization decreases. Under all alternatives, as D&D activities are completed, the Emergency Preparedness staffing requirements decrease to five persons to maintain a downsized Emergency Operations Center, perform onsite and offsite notifications, update hazards assessments, revise emergency plans and procedures, interface with the State and local municipalities, design and conduct emergency response drills and exercises, and perform emergency response operations. Plume dispersion modeling and meteorological data support may be provided by a DOE-sponsored regional response center. Emergency activation requirements would be serviced by a commercial paging system. Following the end state, or as Alternative 4, Mothball, is implemented, staffing might be reduced to one emergency preparedness person responsible for programmatic planning and operations interface.

Occurrence reporting responsibilities are likely to increase as D&D efforts progress. For all alternatives, minimum occurrence reporting responsibilities late in the project would require staffing by one person, with much of the reporting responsibility absorbed by the operations staff in each remaining facility. Should Alternative 4, Mothball, be initiated, two occurrence reporting staff members would be required to maintain an investigation and reporting capability for continued operations, surveillance, and investigation.

Costs shown in the table at the end of this section under Emergency Preparedness represent those O&M costs for an inherent staff to maintain minimum program responsibilities. It is not envisioned that emergency preparedness and occurrence reporting requirements could be provided through public sources, such as contractual support through a municipal source. However, privatization of these functions to local contractors or small business interests could be accomplished. The overriding consideration for privatization rests with the responsibility to continue to meet our obligation to notify the public of events and to establish a response system to minimize the impact on the public and workers of hazards from an accident.

Fire Prevention and Protection

For all alternatives, requirements for maintaining an inherent fire response capability are driven by time criteria for response to pyrophoric materials and structural or medical emergencies (six minutes), and the need for liability reduction during D&D efforts when material is being relocated, facilities vacated, and systems impaired. A baseline emergency medical service must be maintained throughout the D&D effort because local emergency support is not readily available to assist. The nearest emergency medical treatment capability is located at Jefferson County Airport through North Metro Fire District. Fire prevention and response training would continue for staff in remaining facilities. This fire training could be expanded to provide for first responder capabilities similar to the Building Emergency Support Team training and operations currently in place. However, during D&D efforts, it is advisable to have a certified and trained fire team to respond to nuclear material-related fires, hazardous material accidents, and medical emergencies. Minimum fire protection and prevention staffing requirements are as follows:

Staffing	Service	Alternative Stage
54	Current	Early
48	Single Engine, Hazardous Materials, Emergency Medical Serv ices (EMS)	Middle
32	Single Engine, EMS	Late
0	Contract service, if necessary, for wildland fire fighting	When SNM is removed from the Site.

Occupational Medicine

For all alternatives, occupational health services and medical treatment would be privatized during FY96 and FY97. Services provided by the Fire Department for emergency medical support will continue, and ambulance service for evacuation of injured personnel will continue as currently stipulated through a Memoranda of Understanding with local area hospitals. Consultant medical assistance is normally required under existing agreements with Occupational Medicine and Fire Services. This function would remain and should be included as part of the contractual services provided under a privatization contract.

Medical treatment for minor injuries, medical examinations, and maintenance of medical records under DOE regulatory requirements would be maintained under contract with a privatized medical service.

Continuation of health effects studies would be accomplished by contractual agreement. It is assumed that these studies would be sanctioned and funded by DOE Headquarters using predetermined program requirements and funding. As such, the continuation of health effects studies would be separated from the infrastructure funding needs during ASAP. Should DOE Headquarters decide to discontinue funding for these programs, then an assessment would have to be made on the propriety of program continuation under contract stipulation. Employee assistance services would continue to be provided through the privatized, contracted service. The total cost of subcontracted service per year to support an end population of 300 personnel is estimated at $370 thousand with an additional $3 thousand annually of DOE funds for health effects programs.

The following tables (E-2 and E-3) provide costs of emergency services for each alternative. The first table provides those costs expected to be incurred during implementation, and the second provides those expected after alternative implementation completion.

Table E-2
Emergency Services Program Costs Per Year During ASAP ($000)

Program	1	3a	3b	3c/d	3e	4
EMERGENCY PREPAREDNESS	650	650	650	650	650	650
FIRE SERVICES	4,700	4,700	4,700	4,700	4,700	4,700
OCCUPATIONAL MEDICINE	3,400	3,400	3,400	3,400	3,400	3,400
TOTAL	8,750	8,750	8,750	8,750	8,750	8,750

Table E-3
Emergency Services Program Costs Per Year After ASAP ($000)

Program	1	3a	3b	3c/d	3e	4
EMERGENCY PREPAREDNESS	0	500	500	500	500	500
FIRE SERVICES	0	1,500	1,500	500	500	2,500
OCCUPATIONAL MEDICINE	0	400	400	400	400	400
TOTAL	0	2,400	2,400	1,400	1,400	3,400

4.2.3 Logistics and Property Management

The Logistics Organization is a multi-functional organization that supports the Site in all areas of operations. The following logistical services with their relationship to the various alternatives are defined in this section:

Receiving and Shipping
Warehousing
Transportation
Garage and Vehicle Fleet Mgt.
Road and Ground Maintenance
Property Management
Property Utilization and Disposal
Traffic

Receiving and Shipping

The Receiving and Shipping Department is located in a centralized facility for receipt and shipment of all inbound and outbound materials at Rocky Flats. This operation is currently housed in Building 130, a facility specifically built for this function. Based on the current planned configuration of the various alternatives during the D&D project phase, it would be advisable that this facility and the operation remain as is until most of the D&D work is completed. This facility is equipped with the necessary equipment to accommodate all aspects of receipt of materials that are inbound to the protected areas. Current security policy for the detection of contraband material is implemented within this building. This facility is also equipped with the only full size truck scale for weighing shipments of outbound materials, a requirement for compliance to Department of Transportation regulations for all in commerce shipments.

As the site downsizes and relocates offsite, and outbound shipments are completed, this facility and its centralized functions will no longer be required; the functions can be accomplished independently at the few remaining facilities onsite.

Warehouse

Three warehouses currently are operated under the logistics umbrella: Building 551, Building 061, and Building 020. Building 551, one of the oldest buildings onsite is the centralized warehouse for general stores and spare parts inventories which support site operations. Additionally this warehouse is the staging area for all maintenance type materials that support the maintenance activities for all operations areas. Building 061, a leased facility, is the central warehouse used for the control and disposal of excess government property (see section titled Property and Utilization). Building 020 is also a leased facility that currently is used for the waste container (new containers) inventory as well as an overflow warehouse for spare parts inventory and a offsite center for Supplied Breathing Air training.

The need for these facilities during and after the implementation of the various alternatives was reviewed with the following conclusions. Building 551 contains thousands of items in the current inventory that will no longer be required to support the Site's mission. After they have been disposed, this building or other suitable storage facility onsite could then be used to move the Waste Container Warehouse (Building 020) back onsite. The relocation of this warehouse back to Site would result in a savings of $250 thousand annual lease cost and provide ready access to a facility that would be in high demand during the D&D project.

Building 061 is currently on a long-term lease, and it is anticipated that this facility will be required for the duration of the D&D process to stage the large amount of excess equipment and materials that will be released from the buildings as they are decommissioned.

As part of any major construction program, there will be a need for supplies, equipment, and materials and a facility where they can be stored and accounted for until they are required at the construction site. There is a need for this service at some level of effort depending on the preplanning of each project. After completion of the D&D process, the traditional warehouse function will not be required.

Transportation and Road and Grounds Maintenance

The Transportation organization includes five elements: Trucking Services, Heavy Equipment, Laborers, Garage, and Vehicle Fleet Management. As part of the centralized support services, the Transportation organization supports the movement of all materials, both hazardous and nonhazardous, new equipment, and materials being distributed onsite as well as to outlying leased facilities. As part of the Transportation Organization, all heavy equipment and operators are centralized within this organization. The Heavy Equipment Operations currently provide support in activities involving soil excavation for maintenance and repair of underground utility repairs, landfill earth movement, road repair, movement of large equipment, snow removal, and dam repair. Associated with this workforce is the laborer classification that provides the maintenance of grounds and road maintenance. The work under this classification includes weed and vegetation control, road repair and signage, snow removal, and personnel furniture moves.

The Garage and Vehicle Fleet Management Organization provides the repair and maintenance of the Site vehicle fleet, and fueling and maintenance services to the Site emergency generators. The management of the sitewide Government Services Administration fleet is also maintained by the administrative section of the garage.

The centralized structure during the initial D&D program in all the alternatives will maximize the use of transportation resources. Once the D&D process is nearing completion, a decentralized support by project and eventual caretaker group will suffice for this service. Optional commercial proposals should also be pursued after D&D completion.

Property Management and Property Disposal

As the D&D process gets underway in the alternatives, this organization will need to expand to respond to the needs of the program. The Property Management Organization is responsible for the accounting and disposal of all government property. The disposal of excess government property will be a formidable task due to the limited warehouse space and the amount of property (equipment and materials) that will be removed from the buildings and entered into the property disposal process. There will need to be a adjustment to the operating budget of this organization to accommodate a much larger scope of work than has been experienced in the operation of the Site to date. Alternate warehouse space will be required to house this property until it can be disposed. The current warehouse facility, Building 061, will not provide enough space to keep pace with the D&D Project. The current funding level for this organization is $1 million and will have to increase by a factor of two or three.

Traffic

The Traffic Department is responsible for the control and movement of shipments onsite and offsite of materials and equipment, both hazardous and nonhazardous, in accordance with the Department of Transportation. The Traffic Department is a vital link to safe and continuous operations of shipment of waste of all types as well as special nuclear materials. Due to the anticipated high number of shipments in this category, this organization would remain onsite for the duration of the D&D process and beyond for all alternatives.

In summary, logistics would be the same for Alternatives 3a, Phased Shipment; 3c, Excavation; 3d, Leveled Buildings; and 3e, Entombment and Landfill, but the additional facilities in 3b, Priority Shipment and 4, Mothball, would require two-to-three extra full-time employees.

4.2.4 Facility Leasing

Facilities and personnel space management provides appropriate office space for personnel. For the purpose of this report it will be termed Facility Leasing to avoid the assumption that facility operating costs are part of this section. The costs associated with the relocation of personnel onsite and offsite during the D&D phase were reviewed and the following assumptions were made:

1. Facility decommissioning activities would likely exceed the rate at which the Site population is reduced in all alternatives except Alternative 1, Unrestricted.

2. Interlocken and Lake Arbor would be the only offsite facilities with existing leases and space available for all displaced personnel.

The following estimates were used in this analysis:

1. Cost for moving, per employee: $400

2. Average space allotted per employee: 135 sq ft.

3. Average lease rate is $17/sq ft.

The cost table below provides costs for personnel relocations, and leasing costs incurred per year.

Table E-4
Facility Management Relocation Cost Estimates

YEAR	COST	CALCULATION (1)	LEASE COST
1996	$ 106,800	267 FTE @ $400	$0
1997	350,400	876 FTE @ $400	283,500
1998	328,000	820 FTE @ $400	1,660,500
2000	166,800	417 FTE @ $400	844,425
2002	81,200	203 FTE @ $400	411,075
2004	236,800	592 FTE @ $400	1,198,800
2006	416,400	1041 FTE @ $400	2,108,025
2008	368,800	922 FTE @ $400	1,867,050
Total 13 yrs	$2,055,200		$8,373,375
Avg. yearly cost	$ 300,000		$1,200,000

FTE = Full Time Employee

For purposes of this analysis, an average of $1.5 million per year was used for leasing costs for each of the alternatives during the implementation stage. Once the alternatives have reached the point where only waste and SNM are onsite, it is anticipated that administrative personnel would be housed offsite in leased facilities. For Alternatives 3d, Leveled Buildings and 3e, Entombment and Landfill, that cost would be $500 thousand/year. The additional monitoring requirements in Alternatives 3a, Phased Shipment, and 3c, Excavation, would cost $600 thousand/year and Alternatives 3b, Priority Shipment, and 4, Mothball, with all the additional buildings would cost $600 thousand/year.

4.2.5 Analytical and Metrology Services

The analytical services requirements were based on the following assumptions:

1. TRU and LLW labs will develop capability to meet universal treatment standards.

2. Offsite laboratories will have sufficient capacity to analyze all samples under 2 nanocuries (nCi) excluding bioassay.

3. All sampling of contaminated wastes will be performed onsite.

4. All sampling of environmental media will be performed as a subcontract service.

5. The 881 laboratory will become a new 100 nCi lab and will relocate to a modular facility onsite in FY98.

6. The 123 laboratory will relocate offsite in FY97.

7. Most analyses will increase for each facility during the strip-out two years prior to the actual D&D work.

During the D&D operations, bioassay needs would increase due to the nature and level of radiation activities. Urine and fecal sampling would increase. It is anticipated that emergency response sampling and analysis would also increase. A significant increase in environmental sampling and analyses would be required but waste analyses should remain at today's level. The analytical services would experience an increase in operating costs through the first stages of D&D projects and then would be phased down to minimal staffing levels in an offsite or possibly portable laboratory onsite.

Metrology services in support of the production buildings during the various D&D alternatives typically would be based on the calibration requirements within each of the operating areas. It is estimated that this service would continue to downsize based on the reduction of the operating buildings and the elimination of calibration requirements. Upon completion of all D&D activities the Metrology services would be turned over to the caretaker for the few remaining buildings.

4.2.6 Facility and Equipment Maintenance

Facility maintenance operations would continue for all alternatives. Currently facility maintenance budgets across the Site total approximately $94.0 million annually, which includes all costs necessary to support the maintenance effort (i.e., planning, engineering). Initially, maintenance costs may increase, but as the number of facilities decreases, the Site costs will decrease accordingly. In the case of Alternative 1, Unrestricted, those costs would decline over the period of time needed to attain the goal of unrestricted use, at which time maintenance services would no longer be required. For Alternatives 3d, Leveled Buildings, and 3e, Entombment and Landfill, maintenance costs would decline during the project until only the SNM interim storage and waste storage facilities remained onsite. At that time, it is estimated that annual maintenance costs would be $1 million based on 6 full time employees (FTEs) and nominal material costs. Alternatives 3a, Phased Shipment, and 3c, Excavation, would be slightly higher due to additional monitoring requirements. Those costs would continue until all the SNM and waste was moved offsite, and the interim storage facilities could be deactivated. Alternative 3b, Priority Shipment, would require approximately double the maintenance force because more existing and older buildings would be pressed into service for storage requirements. Alternative 4, Mothball, is the same as Alternative 3e, Entombment and Landfill, except that in addition to the new interim storage buildings, the maintenance services would have to maintain the deactivated and evacuated facilities to ensure the integrity of the facilities and the operability of the minimal utility systems in the facilities. This requirement would easily double the maintenance force over Alternative 3e, Entombment and Landfill, and the cost would be $2 million annually for an indefinite period.

4.2.7 Laundry

Laundry services will have to continue as long as there are contaminated materials onsite and decontamination of equipment and facilities is taking place. It is anticipated that the Laundry would continue at its current level until those activities are completed. The annual costs for the Laundry are $1.8 million. Once the SNM is in the new SNM interim storage facility, and the contaminated waste is sealed in containers, bunkers, or buried, it would be possible to close out laundry operations, and use disposable coveralls for the few times it would be necessary to access the SNM in interim storage.

4.2.8 Site Security

As long as the Site remains in the current configuration, the security force will continue at its current size, even as the number of buildings decline. The major milestones to reducing the security force is reduction of the Protected Area, reduction in buildings with material stored in them, and elimination of SNM material onsite. The current operating budget of the security forces is $45.7 million annually. Substantial reductions in that budget would be possible as the above milestones take place and would reach zero when all material is offsite as is the case for Alternative 1, Unrestricted. That process would spread over a longer period of time for Alternative 1 than for Alternatives 3a, 3c, 3d, and 3e. With those alternatives, the Site would reach the end of the alternative much sooner, at which time the security force would consist of a small onsite force of approximately 50 FTEs to safeguard material left onsite in the SNM interim storage facility. The annual cost would be $5 million until the SNM was relocated offsite. Alternative 3b, Priority Shipment, with additional buildings to cover will require an additional 15 FTEs. Alternative 4, Mothball, would be the same concept, but the milestones would be attained somewhat faster. However, the security would be increased at the end to not only safeguard the material but to provide physical security of the abandoned buildings left onsite. That force would approximate 80 FTEs and annually cost $8 million indefinitely.

4.2.9 Custodial Services

Custodial services currently operate under a budget of approximately $10 million annually spread out in facility budgets across the Site. As in the case of most of the other services, the custodial service would gradually decline as the number of facilities declines. Once the end state of Alternative 1, Unrestricted, is reached, the services would be zero. Once the interim state of the other alternatives is reached, the custodial services would be minimized to 5 FTEs per year or $500 thousand annually until the material is shipped offsite.

4.2.10 Filter and Respirator Testing Services

The filter and respirator testing budget is currently $2.4 million. After the Site reaches the state in which only Buildings 371 and 707 remain, that budget could be reduced significantly to approximately $300 thousand. Once buildings 371 and 707 are deactivated, the service would be required to only change filters in the SNM interim storage and waste interim storage facilities, but it would be done by maintenance. For Alternative 3b, Priority Shipment, the remaining buildings would still have filters with passive ventilation and require $300 thousand annually for maintenance of the filters. For Alternative 4, Mothball several buildings would require passive ventilation through HEPA (high efficiency particulate air) filtration.

4.2.11 Food Services

The cafeteria budget is $1.2 million annually and can be decreased as the plant population decreases either through attrition or relocations to offsite facilities. Since Building 130 would be operating until late in the project implementation stage of any of the alternatives, the cafeteria in 130 would be the last one to cease operation. No cafeterias would be relocated and none would be built. Once Building 130 is deactivated, cafeteria services would be discontinued.

4.2.12 Radiological Protection

Radiological Protection services will be required as long as there is the possibility of radiological contamination onsite. The current budget for Radiological Protection is $55.5 million for just under 500 personnel. For Alternative 1, Unrestricted, that number would gradually decline to zero throughout the alternative implementation as contaminated buildings were demolished, contaminated waste shipped offsite and the radiological material removed. For Alternatives 3d, Leveled Buildings, and 3e, Entombment and Landfill, a force of 12 personnel would be required after reaching the interim state since there would still be SNM and/or contaminated waste onsite. The additional monitoring that would be done in the interim retrievable waste storage facilities of Alternatives 3a, Phased Shipment, and 3c, Excavation, would require an additional 8 personnel. Finally, the extensive Radiological Protection required to provide periodic inspections and maintenance in the buildings left onsite for Alternatives 3b, Priority Shipment, and 4, Mothball, would require a total Radiological Protection force of 45 personnel at an annual cost of $4.5 million.

Table E-5 below summarizes annual costs for infrastructure services both during the alternative implementation and after the Site has reached the state as described in the alternatives, which are listed across the top of the table.

4.3 New Projects Required by ASAP

4.3.1 Relocate Central Server Facility

This project would relocate the Site's Central Computer Server from Building 881 to another facility slated for long-term use during ASAP alternative implementation. This project supports the ASAP objectives to vacate and deactivate the major Process Buildings such as 881 within the next two-to-five years. This project is scaled to house only server equipment, not the mainframe and associated equipment in the current facility.

4.3.2 Replace Steam Line Into the PA

This project will replace one 15-year-old underground steam line that provides steam to most of the buildings within the PA. The supply lines provide steam to a looped distribution system within the PA. The two distribution loops can be tied together in the event that one of the two supply lines into the PA is taken out of service. One of the two lines is currently out of service due to a rupture in the line. This leaves only a single line of supply into the PA. This remaining line is also showing signs of deterioration and represents a single point of failure for this system.

4.3.3 Replace Steam Isolation Valves

This project will repair and or replace the major isolation valves throughout the Sites' Steam Distribution System. The majority of the existing valves are old and cannot be fully shut off. This project supports ASAP objectives as it will allow various sections of the Steam Distribution System to be deactivated or isolated as buildings are deactivated or demolished.

4.3.4 Retube Boilers #5 and #7

This project will totally replace the steam tubes in Boilers #5 and #7. Boilers #5 and #7 are two of the four boilers in the Steam Plant. Boiler #7 is currently inoperable due to severely corroded and ruptured tubes. Only one of the other boilers (#6) has been retubed. Retubing of Boilers #5 and #7 would provide three reliable boilers that would meet the Site's steam requirements throughout the ASAP Project implementation.

Table E-5
Services Cost Summary ($000)

SERVICES		1	3a	3b	3c	3d	3e	4
Commun.	– during	11,000	11,000	11,000	11,000	11,000	11,000	11,000
	– after	0	500	500	500	500	500	750
Emer. Serv	– during	8750	8750	8750	8750	8750	8750	8750
	– after	0	2400	3400	2400	1400	1400	3400
Logistics	– during	16000	16000	16000	16000	16000	16000	16000
	– after	0	500	500	500	500	500	750
Fac Leasing	– during	1500	1500	1500	1500	1500	1500	1500
	– after	0	600	600	600	500	500	600
Lab Serv	– during	23,600	23,600	23,600	23,600	23,600	23,600	23,600
	– after	0	500	500	500	500	500	750
Fac. Mtce.	– during	94,000	94,000	94,000	94,000	94,000	94,000	94,000
	– after	0	1,200	2,000	1,200	1,000	1,000	2,000
Laundry	– during	1,800	1,800	1,800	1,800	1,800	1,800	1,800
	– after	0	0	0	0	0	0	0
Security	– during	45,700	45,700	45,700	45,700	45,700	45,700	45,700
	– after	0	5,000	6,500	5,000	5,000	5,000	8,000
Custodial	– during	10,000	10,000	10,000	10,000	10,000	10,000	10,000
	- after	0	500	500	500	500	500	500
Filter Test	– during	2400	2400	2400	2400	2400	2400	2400
	– after	0	0	300	0	0	0	1,200
Cafeteria	– during	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	- after	0	0	0	0	0	0	0
Rad Prot.	– during	55,500	55,500	55,500	55,500	55,500	55,500	55,500
	– after	0	2,000	4,500	2,000	1,200	1,200	4,500
Total	– during	271,450	271,450	271,450	271,450	271,450	271,450	271,450
	– after	0	13,200	19,300	13,200	11,100	11,100	22,450

4.3.5 Repair Boiler Fire Box Refractories

This project will refurbish the fire boxes on Steam Boilers #4 and #5. The existing refractories are deteriorated and have reduced the efficiency and reliability of these two boilers. This project is needed to extend the near-term service life of these two boilers.

4.3.6 Upgrade Fire and Domestic Water Distribution Water Distribution System

This project will install approximately 5600 ft. of new water main, 20 new isolation valves and 5 fire hydrants. The existing water distribution system is old, and components in various areas of the Site are deteriorated to the point of needing replacements to maintain continued reliability of the system.

4.3.7 Maintain/Resurface Site Roads Activity

This project is designed to be a series of multiyear subprojects that will extend the service life of roads throughout the Site. There have not been any paving repair or resurfacing activities accomplished on site for the past seven years. As a result, several heavily traveled roads and streets have significantly deteriorated. There is a high probability that two of the proposed ASAP alternatives would result in significantly increased traffic flow of large heavy trucks involved in D&D and waste hauling activities. This series of projects will be focused on those streets and roads expected to handle this increased traffic.

4.3.8 Power Pole Replacement

This project would replace deteriorated power poles, wooden cross arms, and pole hardware throughout the Site. This work will extend the service life of the Electrical Distribution System.

4.3.9 Install Domestic Water Pipeline

This project would install a new 8-inch domestic water line from a local municipal water supply system to the Site. This new line would provide for both domestic and fire suppression needs for the long-term remaining SNM and waste interim storage facilities, and would allow for the deactivation of the Site's Water Treatment Plant.

4.3.10 Reconfigure Natural Gas System

This project would reconfigure the existing natural gas distribution system to provide natural gas to the long-term remaining SNM and waste storage facilities. It would also upgrade that portion of the system that would remain. (Not required for Alternative 3d, Leveled Buildings.)

4.3.11 Install New Sewage Lagoon

This project would install a new central sewage lagoon, which is preferred for providing sewage treatment to the new SNM and waste interim storage facilities and the few other buildings remaining near the end of the project stage for the alternatives. Once completed, the existing waste water treatment plant could be deactivated and, depending on the particular alternative, demolished. (Not required for Alternative 3b, Priority Shipment.)

4.3.12 Install New Sewer Line

As an alternative to the centrally located sewage lagoon, this project would install a new 12-inch sewer from the Site to a local municipality-owned sewage collection and treatment system. This new line will support the remaining SNM and waste interim storage facilities. It would also allow for the deactivation of the Site's Waste Water Treatment Facility.

4.3.13 Replace Built-Up Roofs

Reroofing projects are required to maintain both the structural integrity and leak tightness of the facilities during passive deactivation or while awaiting demolition. Most existing roof systems were replaced in the middle 1980's. Based on Colorado weather extremes and extensive experience with Site roofing conditions, most built-up roofs will start to fail in a catastrophic way in 15 years. In addition, within the last several years, built-up roofs at Rocky Flats have had minimal preventive maintenance which will result in an even shorter life span.

Some roofs are already showing signs of failure. When built-up roofs start to fail it is frequently impossible to locate the specific area of leakage for proper repair. Since roof integrity is critical to worker safety and environmental protection, it is important that roof systems be replaced before internal operations are seriously impacted. If extraordinary maintenance measures cannot maintain roofing integrity, then replacement may be an economically viable option. However, based on the remaining life of a specific building, the replacement roof could be a temporary system installed at a cheaper cost with a minimum life span of less than 15 years.

Table E-6 below projects the costs of new projects needed to sustain or extend the service life of site infrastructure facilities, systems, and equipment for the various alternatives in terms of how many times similar type of work or repair would have to be accomplished over the anticipated life of the alternative. The time span used for sustaining or extending infrastructure service in Alternative 1, Unrestricted, is 30 to 50 years; 10 to 15 years for Alternatives 3a, 3c, 3d, and 3e; 15 to 20 years for Alternative 3b, Priority Shipment; and Alternative 4, Mothball is carried out to 50 years. While activities and repair costs would actually decrease over the years as the size of the Site diminished, the same cost figures were assumed to account for inflation and other potential activities or repairs not delineated in this section. Table E-6 also lists the new infrastructure activities needed on a one-time basis to provide public or commercial utilities for SNM and waste interim storage buildings.

Table E-6
New Project Requirements
($000)

Project Title	TEC $	1	3a, 3c, 3d & 3e	3b	4
Relocate Cent. Computer Fac.	1,800	$ 1,800	$ 1,800	$ 1,800	$ 1,800
Replace 1 Steam Line into PA	1,900	3,800	1,900	3,800	1,900
Replace Steam Isolation Valves	700	1,400	700	1,400	700
Retube Steam Boiler No. 7	1,100	2,200	1,100	2,200	1,100
Retube Steam Boiler No. 5	1,100	1,100	1,100	1,100	1,100
Repair Boiler Fire Box Refractories	200	400	200	400	200
Upgrade Fire & Domestic Water Distribution	5,800	11,600	5,800	11,600	17,400
Maintain/Resurface Site Roads	5,000	15,000	5,000	15,000	20,000
Power Pole Replacement	1,100	2,200	1,100	1,100	3,300
Install Domestic Water Pipeline	5,400	5,400	5,400	5,400	5,400
Reconfig. Natural Gas System	1,600	3,200	1,600	0	4,800
Install Sewage Lagoon	200	200	200	0	200
TOTAL		$48,300	$25,900	$43,800	$57,900
Install New Sewer Line[1]	2,300	$ 2,300	$ 2,300	$ 0	$ 2,300

1 – This project is a potential alternate to installing a sewage lagoon to support the remaining SNM and waste interim storage facilities. It is not included in the total cost for each alternative.

Table E-7 below includes a list of reroofing projects that would be needed to maintain the structural integrity of the major buildings for each alternative. The table projects costs for each alternative based on a life span for the roofs. Alternative 1, Unrestricted, is expected to exceed 30 years total; however some buildings will be demolished early in the project. Alternatives 3a, 3c, 3d and 3e are expected to take 10-to-15 years; 3b, Priority Shipment, is expected to take 15-to-20 years; and Alternatives 3e, Entombment and Landfill, and 4, Mothball, are projected at 50 years.

Table E-7
Roof Replacement ($000)

Bldg.	Roof Sq.Ft.	Last Acc.	Year Due	Est. Cost	1	3a, 3c, 3d & 3e	3b	4
444	102,000	86	01	1,000	$ 2,000	$1,000	$ 2,000	$ 4,000
559/561	42,000	85	00	420	1,260	420	840	1,680
707/708	113,000	86	01	1,200	3,600	1,200	2,400	4,800
771/774	97,000	86	01	1,000	2,000	1,000	1,000	4,000
883	39,000	86	01	400	400	400	400	1,600
881	70,000	86	01	700	700	700	700	2,800
991	34,000	86	01	350	1,050	350	1050	1,400
776/777	154,000	88	03	1,600	3,200	1,600	1,600	6,400
779	40,000	88	03	400	400	400	400	1,600
865	40,000	88	03	400	400	400	400	1,600
886	14,000	88	03	150	150	150	150	600
371/374	104,000	89	04	1,100	3,300	1,100	2,200	4,400
443	16,000	84	99	160	480	160	320	640
TOTAL					$18,940	$8,880	$13,460	$35,520

4.4 Effect of ASAP on Existing Projects

This evaluation of each project considered applicable assumptions as noted in Section 3.3, the current status of the activity life-cycle, and a rough estimate of impact and cost savings. The details for each project follow.

4.4.1 Underground Storage Tanks

This project brings 19 underground storage tanks (USTs) into compliance with federal and state regulations requiring overfill and spill prevention, corrosion protection, and leak detection. Failure to bring all USTs into federal compliance by December 22, 1998 could result in minimum fines and penalties of at least $5 thousand per day per tank.

The current strategy for bringing the USTs into compliance includes replacing the old tanks with new tanks and then closing the old tanks. Eighteen of the USTs service emergency generators provide power to buildings involved with either vital safety systems or Security and Emergency Operations Center operations. Those USTs will be replaced with aboveground storage tanks (ASTs). The USTs at the Building 331 gas station will be replaced with USTs, and a new fuel island and fuel management system will be constructed. All existing tanks will be closed after the new tanks are in place to avoid an interruption in service to the buildings serviced by the USTs.

Table E-8 lists buildings that are serviced by the USTs covered under the scope of the ASAP project. Included in the list are the buildings that are ultimately supported by the USTs.

Table E-8
Buildings Serviced by USTs

TANK #	BUILDING	IMPACTED
1	B120 – West Gate	No
3	B127 – B111/EOC	No
4	B371	No
5–8	B331 – Gas Station	No
14	B559	No
15	B562 – B561	No
16	B709 – B707	No
18	B727 – B729	Potential
19	B729 – B779	Potential
21	B771	Potential
23	B776	Potential
24	B779	Potential
25	B827 – B883, 865, 886	Potential
32	B920 – East Gate	No
33	B989 – B991	Potential
66	B881	Potential

The tanks marked "Potential" above have a potential for descope. The average cost for replacing a tank (fabrication and installation) is $260 thousand. The closure and remediation of the existing tank would still be required to meet federal mandated requirements.

Additional factors that influence the decision to descope specific tanks include:

- Obtaining regulatory flexibility from the December 1998 deadline is not likely. The EPA has previously stated that no extensions will be granted for federal facilities.
- If deactivation of major process buildings assumes a passive state, then vital safety systems (VSS) and associated emergency generators or tanks will not be operational during this period. However, if completion of decommissioning requires operational VSS systems, then emergency generators may still be required. This issue is being reviewed as part of the decommissioning process.
- The final schedule for building usage and deactivation and decommissioning will determine the need for continued use of USTs beyond the federal deadline for UST upgrade or closure.

Recommendation – The activity is currently in construction and it is recommended that construction continue. Tanks marked "Potential" have been scheduled last for construction which will allow for a decision in January 1996 without impacting current schedules. Any delay beyond a decision in January will impact construction costs. In any event, all existing tanks must be closed by the December 1998 Federal deadline unless a regulatory strategy is implemented.

4.4.2 Electrical Distribution: Substation and Overhead

This project will install a new 115 KV/13.8KV main substation, 679/680 substation, with two large main transformers and associated switchgear. This new substation will replace existing substations 555/558 and 661/675 located along Central Avenue and has the capacity to replace all other substations onsite including 515, 516, 517, 518, 661, 675, and 132. The 555/558 substation will be demolished as part of construction with polychlorinated biphenyl and asbestos remediated, and substation 661/675 will be demolished following energizing of the new 679/680 Substation. Title II redesign now underway will include overhead line modifications to accommodate the new substation tie-in.

The existing Site electrical distribution system has substantially exceeded its design-life span. Repairs have become more frequent and costly, and replacement parts are increasingly difficult to locate for the transformers, switchgear, and pole line equipment. It is unlikely that the existing substation and 13.8KV distribution system would survive through the life cycle of any ASAP alternative. Also, in any of the alternatives it would be necessary to consolidate the electrical system and substations as part of the natural evolution of the decommissioning process.

Evaluation – A cost-benefit analysis indicates the following benefits would be realized: The maintenance cost of the removed transformers would be eliminated and the number of transformers to be maintained would be reduced from nine to two. The risk factors would eliminate seven failure points in the existing plant power distribution system. Due to the age and condition of a major portion of these transformers and system switchgear, this would be a significant risk reduction. The immediate goal is to bring the power system into a configuration that would allow subcontracting of operational and maintenance services of the system to private enterprise.

Recommendation – Consolidation and upgrade of the existing electrical distribution system would be required for privatization of the system. Replacement of all substations with a new centralized substation would reduce operational costs and provide reliable power for any ASAP alternative. Demolition of the 555/568 Substation has started, and construction of the entire project will be complete in FY97. The transformers and switchgear are already onsite. It is recommended that the scope of the activity be continued as planned.

4.4.3 Air Monitoring Improvements

The air monitoring improvements project replaces two outdated Environmental, Safety and Health alarm and monitoring systems with new reliable state-of-the-art equipment in the plutonium facilities and support buildings. The two systems are the Selective Alpha Air Monitoring (SAAM) system and the Criticality Alarm System (CAS). The SAAM system consists of self-contained continuous air monitoring instruments which function to warn personnel that safe levels of alpha radiation in the air have been exceeded. The CAS consists of neutron radiation-sensitive criticality detection instruments (CDIs) connected to a criticality alarm panel (CAP). The CAS functions to warn personnel through audio and visual systems that the building should be evacuated immediately because of unsafe levels of neutron activity. The installation of these new alarm systems will significantly improve worker safety because of the reliability of the modern equipment and the increased detection sensitivity. This activity replaces SAAMs in Buildings 559/561, 707, 371/374, 776/777, 771, 774, 729/779/782, 875/886, and 985/991. The original activity scope replaces CASs in Buildings 559/561, 569, 707, 371/374, 776/777, 778, 771, 774, 729/779/782, 875/886, and 985/991. DOE, RFFO memorandum 10281 dated June 26, 1995, directed construction work stoppage for the installation of CASs in Buildings 559/561, 569, 778, 729/779/782, 875/886, and 985/991.

New SAAM systems are required because the existing SAAMs and the data collection system do not meet the minimum detection level of 8 derived air concentration (DAC) hours as required under 10 CFR 835, DOE Order 5480.11 and the RADCON Manual. The 8-DAC-hour detection range requirement is in excess of the existing SAAMs which are roughly in the 35-to-40 DAC-hour detection range. D&D work increases the potential for airborne contamination. The need for SAAMs in the current configuration and locations will exist during decommissioning, and additional portable units will be required in the decommissioning areas to augment detection capability. The new SAAMs provided by the AMI project can achieve the required sensitivity. It is imperative for worker safety that SAAMs used during decommissioning meet the ordered sensitivity requirements.

New CAPs are required because the existing systems do not meet DOE Orders 5480.4 and 5480.5 which require the criticality system to be electronically supervised to warn of malfunctions such as an open line from a detector, master reset switch failure, alarm-tone frequency generator failure, coincidence-board relay failure, alarm-tone initiation relay failure, and beacon-initiation relay failure. The system must have the capability to perform audibility testing on a periodic basis. The new criticality panels installed under the air monitoring improvement project will correct the system deficiencies and comply with DOE Orders. ANSI (American National Standards Institute) 8.3 states that the need for a criticality system shall be evaluated for all buildings which have more than 450 grams of plutonium 239 total quantity in a building. This evaluation is in the form of a Safety Analysis. Present Final Safety Analysis Reports require CASs to be fully operational. It is expected that buildings will easily exceed the limit due to buildup in the ductwork and other building contamination even after the consolidation of SNM effort removes weapons materials from the buildings.

Evaluation – The air monitoring system improvements are required to preclude unnecessary worker exposure to radioactive contamination. The air monitoring instruments (more than 400 SAAMs) have been procured. There would be no financial credit for returning this new equipment. Construction is scheduled for substantial completion in FY96. One ASAP timetable begins demolition after FY96. Nearly all of the buildings that are receiving new air monitoring instruments will be demolished four or more years after FY96. Reliance on air monitoring systems is even more crucial for decommissioning work in the plutonium buildings than it is for present day operations. The air monitoring instruments can be easily removed when no longer needed in support of demolition and the instruments can be reused at other locations where needed to support D&D work. The SAAMs can be readily converted to portable units for use at remote locations where central vacuum service is not available. The result of this evaluation is that the air monitoring improvement project must be completed in accordance with present scope requirements. There are no reasonable options for worker safety.

Recommendation – Continue to complete the air monitoring improvement project as presently scoped (excluding the Criticality Alarm Systems in the six building groups noted above).

4.4.4 Representative Effluent Samplers

The Representative Effluent Samplers (RES) project replaces existing Record Sampling (RS) units in the plutonium building effluent stacks and upgrades 37 effluent SAAMs in the plutonium buildings. The original activity scope replaced SAAMs in the building ducts and effluent stacks. Forty-eight RS units will be installed in the effluent stacks. Mixing boxes will be added in the effluent stream to ensure representative sampling. Each RS system consists of a filter paper record sampler connected to sampling probes by transport lines. A representative sample of duct effluent air is extracted from the duct by a new stainless steel high efficiency probe assembly. The existing health physics vacuum system draws the air sample to the filter paper record sampler through the transport lines. Twice weekly, any particulate deposited on the record sampler filter paper is analyzed for radionuclide content. The samples taken will be obtained in a representative manner that does not distort the particle size distribution. The original activity scope provided 48 new real-time monitors (SAAMs) at each RS location and at 27 other existing SAAM locations sampling from effluent ducts. The original RES activity scope replaced RS units and effluent SAAMs in Buildings 371/374, 561, 707, 729, 771, 774, 776, and 782 and it replaced only effluent SAAMs in Buildings 777, 779, 875, 985 and 991. DOE, RFFO memorandum dated December 1995, directed descope of all eleven effluent SAAMs and use of new shrouded nozzles and associated sample lines.

Effluent stack monitoring is required in accordance with DOE Orders 5400.1, 5480.1B, 5480.4 and 6430.1A, and 40 CFR 61 Subpart H. The existing stack monitoring system is 20 years old and requires frequent maintenance making the system economically inefficient for maintaining a proactive safety program. The EPA Region VIII issued Rocky Flats an Administrative Compliance Order on March 3, 1992 for noncompliance with the radionuclide monitoring protocol of 40 CFR 61, Subpart H. The EPA order requires Rocky Flats to be in compliance with 40 CFR 61 Subpart H by the end of calendar year 1997. The RES activity will ensure compliance with these requirements for air monitoring. Decommissioning work increases the potential for airborne contamination. Thus the need for representative effluent sampling continues through the decommissioning activities.

Evaluation – The EPA Compliance Order requires completion of the record samplers by December 1997. Record samplers are required until the dose potential is eliminated by building demolition. Building 782 is the first of the RES activity workscope to be demolished in 1999 according to the draft ASAP. The other RES activity buildings will be demolished in subsequent years. RES construction will be substantially complete in FY96. The result is that the RES activity must be completed in accordance with the present scope requirements. There are no reasonable options.

Recommendation – The recommendation is to continue and complete the RES activity as presently scoped (excluding all new effluent SAAMs noted above for which DOE, RFFO directed descope on June 26, 1995).

4.4.5 Waste Water Treatment Plant Upgrades

The Waste Water Treatment Plant (WWTP) Upgrades project adds several improvements to the existing WWTP in three phases. Phase I is complete and included sludge dewatering and drying capabilities. Phase II, currently in construction, provides a 1,600 sq. ft. expansion to Building 995 for laboratory facilities, offices, locker and meeting/lunch rooms, and records storage. Also included are new electrical primary and secondary power, a standby power generator rough-in, miscellaneous electrical modifications, and a drain line to drain the hillside north of Building 995. The existing sand filters north of Building 998 are also being enclosed by a 200 sq. ft. extension to Building 998. This area will be used for dry chemical storage. Phase III will provide two new 500,000-gallon concrete tanks for influent and effluent holding that are being provided as part of an Interim Measure/Interim Remedial Action (IM/IRA) agreement.

The WWTP upgrades are required to satisfy Federal Facility Compliance Agreements, the National Pollution Discharge Elimination System permit, IM/IRA, and Occupational Safety and Health Act (OSHA) deficiencies and to prevent unregulated discharge in case of a spill. The upgrades will provide a functional facility for the remaining life of Rocky Flats. Construction is scheduled to be completed by FY97 to meet the NPDES and IM/IRA agreement deadlines. Laundry water may also be diverted to the WWTP which could increase the potential for unregulated discharge without these upgrades.

Recommendation – Continue the activity as currently scoped. At this time there are no reasonable options to operating the onsite WWTP with the expected rates of flow over the next 10-to-15 years. When the Site population and associated sewage influent to the WWTP fall to a low enough level toward the end of the ASAP timeline, there may then be insufficient influent to allow proper operation of the WWTP. At that time it will be necessary to install a smaller sewage treatment system(s) to accommodate the decreased need.

4.4.6 Criticality Alarm and Plant Annunciation System Upgrade (CAPASU)

The Criticality Alarm and Plant Annunciation System Upgrade (CAPASU) project has two components. The first component provides a new fiber optic sitewide communication network (COMM NET) which provides the safety, security, and communication network required for Rocky Flats. The fiber optic cables will be distributed along overhead steam lines or other existing structures, where possible, to reduce cost.

The second component of CAPASU will upgrade the deteriorated Life Safety Disaster Warning (LS/DW) System in the highest priority buildings required to support the ASAP program. The LS/DW system provides worker safety as related to the annunciation of alarms and dissemination of information within designated SNM facilities, non-SNM facilities, Site support facilities, Site utilities buildings, SNM consolidation buildings, and buildings designated for waste operations and storage. As a cost-effective means of maintaining safety alarms, the LS/DW system is also used to broadcast criticality alarms (CAS) within the plutonium buildings.

The existing site distribution systems for fire, security, and communications systems use underground triax cables which have significant deterioration and cannot be relied upon through the completion of any ASAP alternative. A recent cost payback analysis indicated a 4.2 year payback for the $29.5 million cost of the activity due to high maintenance and compensatory costs. In addition to high maintenance costs, the underground cabling will be impacted by decommissioning processes since the communication systems loop through buildings and exterior remediation sites. As-built conditions for the existing triax systems will not allow for proper identification of underground routing, so it will be impossible to avoid disruptions to service without construction of expensive bypasses as building decommissioning proceeds.

Adequate alarm and communication systems will be required for decommissioning processes when workers will be exposed to highest risks. SNM consolidation will require improved security and accountability systems which require a reliable COMM NET system. The existing systems are inadequate to support site objectives. Various components of existing systems are also deficient in satisfying ANSI standards, OSHA requirements, Resource Conservation and Recovery Act (RCRA) permits and DOE Orders resulting in expensive compensatory measures.

The following activities require the completion of CAPASU in order to perform their functions:

- Plant Fire and Security System Replacement activity (PFSR) requires CAPASU's communication infrastructure to function for new Fire Systems and Security Systems.
- Master Safeguard and Security Agreement activity (MSSA) requires CAPASU's communication infrastructure to function for the closed circuit television and NDA Local Area Network (LAN) Systems. The MSSA activity addresses all security issues associated with Special Nuclear Material and classified material storage. The security portion of PFSR and

MSSA complement each other in providing security functions. As stated above, these require CAPASU's communication infrastructure to function.

- The LS/DW system requires CAPASU's communication infrastructure to function for Criticality Alarm signals to the Central Alarm Station and Secondary Alarm Station, for distribution of announcements from central command authorities, and for connection of supervisory signals by maintenance.
- The Criticality Detection System of the Air Monitoring Improvements activity sends an alarm signal to CAPASU's Criticality Annunciation System and then; this signal is broadcast over CAPASU's LS/DW system upgrades.
- Computing and Telecommunication Systems (C&TS) require CAPASU's communication infrastructure to function for Voice and Data Communications.

Optional Considerations – Radio Frequency (RF) communications have been investigated as an alternative to a fiber optic COMM NET. The RF technology was evaluated as having these issues:

- The cost of the RF system would be approximately the same as a fiber optic system for both installation and operation.
- The level of technology required to meet all needs would be at the cutting edge of commercially available systems, and would therefore be unproven for Rocky Flats application.
- There are unresolved issues in bandwidth and encryption for security that would need research and approval.
- Redesign of the CAPASU and other dependent projects would result in a cost increase and delay of up to one year. This would in turn delay operational cost savings (approximately $4 million per year) and would increase cost for redesign.
- The switch to RF technology at this late date would delay implementation of the new fire system under the PFSR project and the Protected Area Reconfiguration activity.

Overall, a COMM NET based on radio frequency technology would cost more, use unproven technology, delay completion of all projects relying on the CAPASU COMM NET for operation, and through such delay would drive up the maintenance costs of existing systems and delay the start of corresponding payback.

Recommendation – The basic concepts and components of the CAPASU activity should proceed as planned within these parameters:

- Phase A of the activity installs the fiber optic COMM NET. This phase is in the bidding cycle for construction and has been structured to provide flexibility as ASAP decisions are made. The bid package provides for independent pricing for individual loops between buildings, and termination and fiber counts can be adjusted prior to awarding of the construction contract. Phase A has a high immediate return for operational savings and must be installed to accommodate new security and alarm systems under the PFSR, MSSA, and AMI activity.
- The fiber optic COMM NET can be easily expanded in the future to provide an inexpensive communications link to potential new buildings for SNM consolidation and waste interim storage.

- The COMM NET is designed to easily accept transfer of telephone and other communication lines as those services are disrupted during decommissioning of facilities.

- LS/DW systems were originally planned for upgrade through replacement of head-end equipment within buildings and replacement of conduit and cabling in major buildings. New head-end equipment is still required in many of the buildings having the longest life cycle within ASAP Alternatives, but a less expensive substitute for hard-wired conduit and cabling is being considered as a cost-effective approach that will provide more flexibility to support decommissioning within buildings.

- The LS/DW systems upgrades are phased in order to complete the highest priority buildings requiring upgrades early in the ASAP process. Buildings not required to support the ASAP mission are being scheduled to later phases of the project with a high potential for descope as schedules and building usages evolve. This approach protects against premature descoping and provides a cost-effective means to rapidly adjust to mission related decisions.

Overall savings for the COMM NET and LS/DW systems upgrades and related activities are estimated to be in the $12 million to $15 million range. Better estimates will be made as ASAP planning becomes better defined.

4.4.7 Plant Fire/Security System Replacement (PFSR)

The PFSR project will provide a replacement of the existing security alarm, fire alarm, and personnel access control systems. It includes the replacement of central monitoring stations, data communications media, multiplex panels, and a majority of the local fire and security alarm panels and sensors. The replacement system will provide graphic displays and a video switching interface for alarm assessment.

The new sitewide alarm system will be configured with a CAS in Building 121, a Secondary Alarm Station (SAS) in Building 764, a Fire Dispatch Center (FDC) in Building 331, and a Secondary Fire Dispatch Center (SFDC) in Building 115. The CAS will have a Central Processing Unit (CPU) with console, monitors, keyboards, and printers to supervise operation of the security alarm systems throughout the Site. The SAS will have identical equipment and will control the security alarms in the event of failure of the CAS. The redundant CPUs will monitor each other for automatic switchover in the event of a failure. The FDC and SFDC will have consoles, monitors, keyboards, and printers to supervise operation of the fire alarm systems throughout the Site.

The main building multiplex panels will communicate with the CAS, SAS, FDC, and SFDC by means of a communications network. The new network will be provided as part of the Criticality Alarm and Production Annunciation System Upgrade (CAPASU) activity (92-D-127). This system will be looped so that a break at any point on the loop will not disrupt communications. There will be two separate, redundant feeds from the communications loop into each of the buildings that contain detector multiplex panels.

The existing fire and security system is outdated, requires intensive manhour effort to operate, and is expensive and difficult to maintain. The current system is not in compliance with DOE Orders 5632.1C, 5632.1C-1, as well as the National Fire Protection Act (NFPA)-72. It has grown far beyond its original design capacity and intended initiating device count. In the process, the ability to annunciate individual devices has, in many cases, been lost. In some areas, dozens of devices are paralleled and report as a single alarm point. The result is that instead of checking the individual device that alarmed, fire department personnel and security forces are required to check, one at a time, all connected devices. Besides being inefficient and expensive, this increases the time required for complete assessment.

System components, many of them manufactured in the 1950's and 1960's, are well beyond their useful lifetimes, and as a result, failures are occurring at an increasingly high rate. On several major system components, the original equipment manufacturers no longer support the equipment. Labor costs associated with maintenance of the alarm system amounted to $4.2 million for FY92. This constitutes an increase of 33 percent over FY91, and a 207 percent increase in the last three years. This cost will continue to increase as the current system continues to deteriorate.

If this project is not funded, Rocky Flats cannot meet the requirements as outlined in NFPA-72 and the Rocky Flats Security Programs. Compliance with the following DOE Orders and mandatory industrial standard requires that the system be replaced.

- DOE Order 5630.13 Master Safeguards and Security Agreement
- DOE Order 5632.1C Protection and Control of Safeguards and Security Interests
- NFPA-72 Standards and Criteria

Assumptions

- Funding will be made available to complete ASAP on schedule. The normal funding process will not support the accelerated activities requirements, and if certain ASAP projects are not completed on schedule due to funding constraints, the effect will ripple through all other programs and plans.

- SNM Consolidation will continue as scheduled. Consolidation will not be impacted by problems, concerns, and delays in other parts of ASAP. It is critical that consolidation of classified matter and SNM be completed in order to descope PFSR project.

- The successful completion of ASAP is dependent on the successful completion of existing capital line item projects that upgrade Rocky Flats infrastructure and systems. These core projects are:

  - The CAPASU Line Item project calls for installing the communications network to be used by the PFSR activity. This project must remain on schedule in order to provide the data network required by the PFSR

  - The MSSA project will provide video signals to the CAS/SAS, and the PFSR project will provide video display and switching capability. Additionally, the MSSA project will be expanding Building 764 to provide space for the PFSR backup computers and the SAS dispatch consoles.

  - DOE Order requirements will be negotiable.

  - NEPA requirements for new activities will be met without impacting construction schedules.

A formal risk analysis has been completed which addresses the current fire alarm system. This effort consists of a building-level analysis of existing fire systems to document the impact on personnel and the environment of a fire related event. This analysis was conducted at the suggestion of the DOE, in order to provide a risk-based approach to justification of fire protection related activities within the complex (ref. D. F. Knuth, ltr. DP-66:Snyder:3-4047 to distribution, Defense Programs Policy on Backfit of Fire Protection Codes/Requirements, December 9, 1992). This information will be used to make decisions regarding fire protection requirements in Site facilities.

Once the Rocky Flats strategic plan is completed, the defined scope will be modified. Due to the fact that future uses of specific buildings are not yet defined, the current approach is that the scope will remain intact until ASAP impacts can be evaluated based on the revised plan. Fire protection requirements during a decommissioning phase may in fact be more stringent due to the specific activities taking place within the facility. Decommissioning activities can present greater hazards than normal operations due to the potential of greater combustible loading during this phase (e.g., plastics, wooden waste crates), and the presence of operations such as cutting and welding. Additionally, there is the potential for nuclear material to be present that could pose a threat during fire conditions (e.g., material within ductwork). Impacts will be evaluated, and any required activity rescoping will be processed through the Baseline Change Control process.

Options – Optional approaches, which have been considered for this activity, primarily consist of continuing the current aggressive maintenance program and compensatory measures during system failures. Neither program is considered to be acceptable for economic reasons.

Recommendations – There is a potential for significant savings on the PFSR project as a result of ASAP. Specific actions being evaluated and/or implemented for the PFSR project include the following:

- Replacement of the current security system will be required in selected Site facilities. Facilities to be upgraded will be chosen based on the SNM and classified matter consolidation schedule, the ASAP building deactivation schedule, and cost/benefit. Existing systems in remaining facilities will report through the new security system. Once SNM and/or classified matter has been removed from these facilities, the security systems will be deactivated.

- Commercial security systems are currently being evaluated for installation. This could allow significant cost savings compared to the present approach. The Argus system will be included in the final cost comparison analysis.

- The design of the security system was placed on hold at the completion of the 60 percent Title II review for Phase A due to lack of funding. The design will be finalized once the commercial systems survey is completed.

- Installation of the fire system will proceed based on future requirements in Site facilities. Replacement of building fire systems will be evaluated based on the published fire system risk analysis, ASAP building deactivation schedule, and cost. The total cost for installation of the fire system is currently projected to be less than $5 million, which is less than 10 percent of the PFSR Total Project Cost. This effort will continue with current funding.

- The reconfiguration of the Protected Area has been placed on hold subsequent to completion of the Design Criteria. This project will be evaluated for descoping and/or rescoping once final ASAP decisions have been made.

Cost and Schedule Impacts – Once final study results are available, and ASAP decisions have been made, necessary approval will be obtained to formally modify the activity baseline. If the above recommendations are incorporated, it is anticipated that the PFSR activity will be completed approximately two years ahead of schedule. Additionally, the activity descope should result in savings of $20-30 million.

4.4.8 Master Safeguards Security Agreement (MSSA)

The Master Safeguards and Security Agreement (MSSA) Line Item project contains 35 subprojects which increase the safety and security of SNM, vital equipment, classified material and government property. In FY95, the scope was increased to include Processing for Accountability and Safe Storage (PASS) which thermally stabilizes and repackages plutonium. The PASS subproject is being evaluated within the plutonium process section of this document.

The subprojects within this line item represent a broad variety of solutions to concerns identified under DOE Order 5630.13 which requires a review of systems for potential vulnerabilities. Not all are considered infrastructure projects to be evaluated under this ASAP task. Many of the projects are complete or substantially close to completion. The remaining projects serve several purposes and are dispositioned below for ASAP alternative implementation impacts.

- Non-Destructive Analysis (NDA) – This equipment supports nuclear material measurement and is considered necessary under any ASAP alternative for waste determination, inventory control, accountability, and security. Delay of this equipment will hold up movement of SNM. It is recommended that activities for this equipment proceed as planned.

- Video CAS/SAS – This subproject supports SNM consolidation and improves security. It will be used to assess security system alarms for the Building 371 Material Access Areas (MAAs). When completed, the subproject will provide an important interface for full assessment capability for Building 371. Video signals will be transmitted to both the Secondary Alarm Station (SAS) and Central Alarm Station (CAS). For security reasons, the systems installed under this subproject are needed regardless of the ASAP schedule. It is recommended that this subproject continue as planned.

- Replace Pidas Equipment – Installation of the new computer equipment is complete and the system will be fully operational shortly. It is recommended that this subproject be completed as planned.

- Upgrade Secondary Alarm Station (SAS) – This subproject will add 2000 sq. ft. to the Building 764 SAS for use by the Plant Fire/Security Replacement project for the new security equipment. It is recommended that this subproject be placed on hold pending a final decision on the configuration of the PFSR system. Potential savings are estimated to be $1.5 million.

- Upgrade X-Ray Machine – This subproject replaces one old X-ray machine with two new machines and will allow two-way traffic through the PA as well as improve reliability. Movement of material and equipment under ASAP would be delayed without this upgrade. It is recommended that this subproject proceed as planned.

- Install Radio Scan/X-Ray Machine – Installation of the new scanners will provide compliance with DOE Order 6532.1C which requires inspection and searches to prevent theft of SNM. Regardless of ASAP schedule, it is recommended that this subproject proceed as planned.

- Building 121 Upgrades – This subproject makes modifications to the armory at the Central Alarm Station. This subproject could be impacted by ASAP dependent of final configuration of the Site. A decision requires further definition of ASAP. Potential savings are estimated to be $230 thousand.

- Explosive Detection – This subproject provides explosive detection capability for Site security. Recent advances will determine the viability of this technology. The recommendation is to maintain this subproject within the scope of MSSA until an evaluation of its effectiveness is complete.

- Grenade Screens at Critical Point Target – This subproject installs grenade screens at ten Critical Point Targets. The need for this installation was based on the vulnerability assessment for the Site Safeguards and Security Plan (SSSP) as a long-term enhancement. It is recommended that the need be reevaluated after the newest SSSP is completed.

- Safeguards and Security Maintenance Improvements – This subproject provides improvement to several S&S buildings. It is recommended that this scope be deleted since affected buildings will be impacted by early decommissioning. Potential savings are estimated to be $1.15 million.

- Safeguards and Security Construction Activity Closeout – This work is scheduled to complete several Inspection and Evaluation (I&E) projects that were never completed under the original I&E scope in Buildings 776 and 777. It is recommended that this scope be deleted since these buildings will be impacted early in the ASAP schedule. Potential savings are estimated to be $1.5 million.

5.0 EVALUATION RESULTS AND RECOMMENDATIONS

Table E-9 below summarizes the costs for each alternative based on a long-term D&D effort (Alternative 1, Unrestricted), a 15-to-20 year D&D effort (the Retrievable, Monitored Storage and Disposal Alternatives, 3a through 3e), and a fast deactivation schedule (Alternative 4, Mothball). These are only estimates. Actual costs will depend on the final schedule for the chosen ASAP alternative.

Table E-9
Evaluation of Existing Project Costs
($000)

TITLE	FNDG[1]	COST PER ALT. 1	COST PER ALT. 3a – 3e	COST PER ALT. 4	COMMENTS
Underground Storage Tanks (19)	$ 8,000	$ 8,000	$ 6,000	$ 4,000	Must get regulatory flexibility to realize savings
Elect. Distr: Substation & Overhead	6,200	6,200	6,200	6,200	Project already descoped
Air Monitoring Improvements	6,600	6,600	5,600	4,600	Delete CAS in early D&D buildings
Representative Effluent Samplers	4,800	4,800	4,300	4,300	Savings dependent on final approval of State and EPA.
Sewage Treatment Facility	3,900	3,900	3,900	3,900	State and EPA will not reduce requirements
Crit. Alarm and Plt Annunciation Sys. Upgrade (CAPASU)	27,400	27,400	15,400	12,400	Dependent on actual ASAP schedules
Plant Fire, Security Sys. Replcmt (exc PA Reconfig[2])	46,900	46,900	26,900	26,900	For 3A thru 4 security system will be installed in 371 and 707 only.
MSSA (excl PASS Proj[2])	21,000	21,000	17,000	15,000	Dependent on actual ASAP schedules
Totals	$124,800	$124,800	$85,300	$77,300	

1 Funding (FNDG) is based on the Congressional approved budget target for current scope less costed funds.

2 PA Reconfiguration, the PASS project and ER/Waste Management activities are not considered to be infrastructure projects and are not included in this evaluation.

6.0 SUMMARY

Each area under Subsection 4, Alternative Options, includes a summary of annual costs against each alternative. Table E-10 below is the table that summarizes yearly costs, in thousand dollars, from each area for the different alternatives.

Table E-10
Infrastructure Summary
($000 Annually)

	Alternative 1, Unrestricted		Alternatives 3a, Phased Ship & 3c, Excavation		Alternative 3b, Priority Shipment		Alternative 3d, Leveled Bldgs. & 3e, Entombment		Alternative 4, Mothball	
	During	After	During	After	During	After	During	After	During	After
UTILITIES	$7,155	$0	$7,155	$229	$7,155	$1,058	$7,155	$229	$7,155	$229
SERVICES (Table E-5)	271,450	0	271,450	13,200	271,450	19,300	271,450	11,100	271,450	22,450
TOTALS YEARLY	$278,605	$0	$278,605	$13,429	$278,605	$20,358	$278,605	$11,329	$278,605	$22,679
Projects for ASAP (Table E-6)	$67,240		$34,780		$57,260		$34,780		$91,620	
Projects Affected by ASAP (Table E-7)	124,800		85,300		85,300		85,300		77,300	
TOTALS PROJECTS	$192,040		$120,080		$142,560		$120,080		$168,920	

Total costs are, of course, predicated on how many years it takes to reach the end state as described in the alternative; however these totals for the alternatives quickly show that Alternative 1, Unrestricted, will be the most expensive because it takes so many more years to reach the end state. Alternative 4, Mothball, appears to be the least expensive, but yearly costs of maintaining abandoned buildings will continue indefinitely.